LAND UTILIZATION
IN
BUDAUN AND SHAHJAHANPUR DISTRICTS
(Uttar Pradesh)

(ABSTRACT)

THESIS SUBMITTED
FOR
THE DEGREE OF DOCTOR OF PHILOSOPHY
IN
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S. SAJID HUSAIN

DEPARTMENT OF GEOGRAPHY
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1968

A B S T R A C T

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The area, being a part of Upper Gangetic alluvial plain which formed through sedimentation upon sinking Archaean geneiss during sub-recent times, is divided into old and new deposits : bangar and khadar. The bangar comprises loamy, sandy loam, clayey loam and the bhur sandy soils with or without patches of alkaline efforescence or kankar nodules; being free from the above contents, the strips of khadar land formed along the Ganga, Ramganga, Garra and Gomati rivers possess sandy soil annually covered by sand and fine silt. Irrigation needed in the tracts of bangar soils while khadar soils generally do not need irrigation owing to relatively high level of the underground water. However, most of the area is occupied by the bangar land soils. The loamy and sandy loam soils extend in tracts from west to east, while clayey loam is found only in the low land tract. Bhur tract is found in the western part.

The general slope of the area is from northwest to southeast and from north to south in the western and eastern halves respectively. But the middle part of the area is a low-land which is mostly subject to flood and waterlogging in the rainy season.

The area is under the direct influence of Ganga river-system which includes the above-mentioned rivers and the Mahawa, Sot, Aril, Bahgul and Khannaut rivers, most of them are perennial.

The year is divided into the cold weather season, hot weather season and the season of summer monsoon rains the last, being most decisive for agricultural operations and water supply round the year. During the cold weather season (November-February), the mean minimum temperature in November is 10°-12°C while mean maximum temperature is 27°-29°C. January, the coldest month records 7°-8.5° and 21°-22°C as mean minimum and mean maximum temperatures. The following months record a gradual increase of temperature. The total seasonal rainfall is 39.8 to 57.7 millimetres.

During the hot weather season (March-mid-June), the increase of temperature is well-marked. The mean monthly temperature in April is between 27.9° and 29.2°C. In may it is 31.9° to 33.5°C. The most excessive temperature conditions often continue to about mid-June when the humidity is lowest of all the year (26-30 per cent at 17-30 hrs. The months are characterised by the loo, the hot scorching wind, and andhi which often raises a huge cloud of dust. The total seasonal rainfall is 27.5 - 40 millimetres.

During the season of rains, there is a continuous decrease of mean monthly temperature from June to October. The daily range of temperatures varies from 7 to 15°C. The mean monthly temperature of June is 32°-34°C. Normally, the monsoon trough running from east to west brings about general and heavy rains with prolonged raining winds. The proportion of clouds (about 5 to 6 octas) and relative humidity (78 to 87 per cent) are maximum in July and August which receive 50 to 60 per cent of the total annual rainfall. The average seasonal rainfall varies from 629 to 1075 millimetres. The average annual rainfa. the area varies from 697 to 1167 millimetres. The frequency of h rainfall is greater in the eastern half than the western. Over 27 per cent is the mean annual variability in the western part while bel 21 per cent in the east. The summer monsoon rainfall has a fluctuati character. The rainfall varies from place to place, and also from year to year. The variability of rainfall is least in July-August being 27 to 45 per cent.

The area under review possesses 5 to 40 per cent of the cultivated land under irrigation. The sources of irrigation include tube-wells, masonry and non-masonry wells, canals, ponds and streams; tube wells in Budaun district and canals in Shahjahanpur district are the most important sources of irrigation. Irrigation is mostly confined to bangar land. In Budaun district, more than 53 per cent of the irrigated area is irrigated by State and private tube-wells whereas in Shahjahanpur district the canals irrigate 66 per cent of total irrigated area. In the whole of the area, the culturable commanded area under State tube-wells is 451,506 acres while under canals, it is 439,228 acres. The other sources irrigate 39 per cent of the total irrigated area. However, total area irrigated from all sources is about 23 per cent of the total cultivated land. The number of masonry wells is 16,040 and of non-masonry wells is 17,439. Ponds irrigating above 100 acres each are 64 while irrigating below 100 acres each are 7,638. Total length of all canal branches, distributaries and minors is 652.923 kilometres.

The total cultivated land in the two districts varies from 69 to 93 per cent of the whole area; the land under forests and meadows is 6 to 7 per cent, under waste land about 2-3 per cent, and under settlements and roads about 4 per cent.

The good quality agricultural land is 13 to 33 and 17 to 35 per cer in Budaun and Shahjahanpur districts respectively whereas medium quality agricultural land is respectively 67 to 87 and 65 to 83 per cent of the total cultivated area.

The big food crops of kharif season are big millet, bulrush millet, arhar (pigeon pea), rice (transplanted and broadcast), sugarcane and maize. Big food crops of rabi season are wheat, wheat-gram and wheat-barley. A ranking of crops shows that the first ranking crops are millets and pulses (mixed), wheat-gram (mixed) and rice in the area, the first being dominant in Budaun district while the last in Shahjahanpur district. The area under first ranking crops varies from 26 to 43 per cent of the total harvested cropland. The second ranking crops include wheat, wheat-gram and millets with pulses. The double-cropped land varies from 7 to 24 per cent of the total cultivated area.

In view of an assessment of several types of land-use surveys conducted in Britain, U.S.A., China, Poland and India, a technique of sample surveying is sought and after an appraisal of various sampling survey methods, the Systematic Purposive Cluster Sampling has been adopted. The physical factors affecting land use have been carefully studied and on the basis of these factors the area has been subdivided into homogeneous strata and from each stratum representative villages which include cluster of fields have been setected. From each soil type in the western and eastern portions, at least one village is setected. Group I includes six villages comprising predominantly loamy soil; group II includes three villages lying in the tract of sandy loam soil; group III consists of two villages of clayey loam soil tract; group IV comprises three villages lying in the khadar lands; and group V has one village situated in the sandy (bhur) soil tract.

On the basis of fertility and produstivity, the cultiv-able lands of each village have been classified into good quality (A) lands, medium quality (B) lands and poor quality (C) lands; further ~~evaluation~~ an evaluation of each category has been worked out to ascertain Potential Production Units of each village.

Food Balance Sheets of each village prepared with the help of crop yield rates, indicate that calorie-intake in villages of the I group is 2138 to 2261 per head per day, while in villages of the II and III groups it is 1960 to 2057, and in the villages of IV and V groups it is below 2000 calories(1865 to 1973) and where under nutrition is clearly indicated.

A house-to-house survey conducted in all the selected villages reveals that there are several nutritional- deficiency-diseases in the rural population. On the basis of their average food consumption per head per day, the Nutrition Balance Sheet for each of the Villages has been prepared which denotes that each of the villages has deficiency of several nutrient elements in the daily diet. The "deficiency" of fat, vitamins A and C and calcium is found in all types of villages; deficiency of protein is also found in some villages. The local insanitary environment along-with under-nutrition and malnutrition has led to the development of many diseases. The lack of many nutrients in the prolonged defective dietetic system makes a considerable percentage of people prone to deficiency diseases.The morbidity, therefore, is 4 to 5 per cent of the population in the villages of the I group, 5 to 6 per cent in the II group villages and 6 to 8 per cent in the villages of the III ,IV and V groups;likewise, the mortality due to diseases caused or increased by nutrition deficiencies is zero to 0.5 per cent of the population in the I group villages, 0,3 to 0.8 per cent in II group villages, 0.3 to 0.8 per cent in III group villages and o.3 to 0.8 pe cent in villages of IV and V groups. Some of the diseases are diabetes,keratomalacia, general weakness, flabby muscles, pneumonia, bad growth of teeth, skin lesions, stunted growth of body, rickets,scabies, scurvy, tuberculosis, night blindness, rheumatism, dental caries, pellagra and goitre,and low-resistence to infection. It is remarkable that the villages having below 2000 calorie-intake per head per day suffer from both under-nutrition and malnutrition; however,imbalanced nutrition has played an adverse role to bring about numerous diseases among the rural population; and the remedy is the scientific improvements in agriculture, improvements in yield-rates, improvements in the sanitary conditions and education of the rural population.

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1968

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11.12.1968

This is to certify that Mr.S.Sajid Husain has worked under my supervision on the topic 'Land Utilization in Budaun and Shahjahanpur Districts (Uttar Pradesh). He has completed the work.

(Mohammad Shafi)

Head of the Department of Geography
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C O N T E N T S

P A R T - I

P A R T - II

PREFACE

This work is an attempt to study geographical factors of Budaun and Shahjahanpur districts and to interpret agricultural land use in the selected villages; it records actual cropland use and other uses of land depicted on the maps. The carrying capacity of agricultural land is worked out on the basis of land use maps and population data collected through field work. On the basis of productivity rating per acre, the potential production units are calculated for each of (good, medium and poor) quality lands. The work also attempts to compute daily intake of calories per head of population; and finally it deals with the deficiencies of various nutrient elements in the daily diet which are correlated with several diseases found by field inquiry.

The work consists of two parts : the first part concerns with physical setting of Budaun and Shahjahanpur districts, agricultural land use and irrigation, and comprises five chapters, namely, structure and relief, climate, soils, agricultural land use, and irrigation in the whole of the area.

Part II deals with the agricultural land use, pressure of population on land resources, malnutrition and under-nutrition and the correlated deficiency diseases in fifteen selected villages in Budaun and Shahjahanpur districts for the year 1962-63. This part is based on field investigation during the kharif and the rabi seasons. It is divided into eight chapters; the first of them, i.e., Chapter VI is about the selection of villages. Chapter VII deals with the selected villages; it also gives a description of the agricultural land use and population in six villages situated in the well-drained areas consisting of loamy soil in Budaun and Shahjahanpur districts; Chapter VIII accounts for three villages of sandy loam soil with inadequate facilities of irrigation; Chapter IX is an account of the land utilization in two villages being located in the low-land which mainly consists of clayey loam soil and is subject to waterlogging in the season of rains; Chapter X deals with three villages situated in the _khadar_ areas of the Ganga and Gomati rivers; Chapter XI concerns with a village situated in the _bhur_ soil tract. Chapter XII gives an account of nutritional deficiencies in the selected villages and it also deals with the deficiency-diseases in the villages. Chapter XIII contains the conclusion drawn on the basis of the study.

In undertaking the present work several sources of information have been utilized by the writer; they may be groupped into three categories: (a) Published books, journals, reports and articles; (b) Unpublished statistical records and accounts; and (c) Field work. As regards the first category, there is hardly any standard work dealing with the problems of agricultural land use, under-nutrition, ecology of malnutrition and occurrence of diseases among the rural population of Budaun and Shahjahanpur districts. Only a few publications, published many decades ago,[1] give a general account of agricultural conditions of the

1. For instance, Moreland, W.H., The Agriculture of U.P. 1912; Mukerji, B.N., Agricultural Regions of the U.P., _Calcutta Geogr.Rev._,1942; Report on agriculture in the U.P., submitted to the Royal Commission of Indian Agriculture, 1926; Contrasts in the Ganges Basin, _Geography_, 1933; Wood, W.A., Rivers and Man in the Indus-Ganges Plain, _Scottish Geogr.Maga._ 1924; Williamson, 'Irrigation in the Indo-Gangetic Plain', _Geogr.Journ._,1925; Dutt, P.K., Ganges Canal Hydroelectric Scheme and Aid to Agriculture in Western U.P., _Indian Geogr. Journ._,1948; Das, C.M., Agricultural Improvements with special reference to the U.P.,1931 Report on Agricultural Station in Western Circle (U.P.),1928.

whole state of Uttar Pradesh and they serve no purpose regarding land use, nutrition and nutritional deficiency diseases on the basis of intensive local surveys. Among the sources of the second category, the Season and Crop Reports of U.P. show yearly statistics of land use and agriculture in the whole State. They do not show actual distribution of various uses of land; actual distribution of various uses of land can be depicted only when the field-to-field local surveys of land use are conducted. However, the unpublished statistical and other records have been utilized to depict on maps the general agricultural land use and irrigation in Budaun and Shahjahanpur districts. For the third category of information, the writer had to undertake an intensive survey of agricultural land use and to investigate several deficiency diseases in fifteen selected villages which were typical of their tracts possessing characteristic types of soil, availability of facilities of irrigation and, in consequence, different sorts of crops with or without irrigation. Outline maps of the villages with defined field boundaries and their areas were taken from the Revenue Departments of different Tahsils; the field-to-field knowledge of the actual use of every piece of land was recorded on the map by on-the-spot observation of fields during the two agricultural seasons of kharif and rabi. Moreover, the house-to-house investigations regarding the deficiency diseases were also conducted in the village-populations in the end of the two seasons. The inhabitants of all these villages were interrogated and all informations about yield per acre, rotations of crops, tillage and fallowing practices, irrigation and manuring problems, underground water-table and the occurrence of various diseases suffered by adult males and females and children and morbidity and mortality from those diseases were recorded.

In each of the selected villages, enumeration of the population actually dependent on the land produce of the village concerned was also undertaken. A classification of population was carried out according to the occupational structure into three groups : (i) the primary rural or the cultivators who exclusively depend on the produce of their cultivated land and (ii) the secondary rural population which serves the former. The adventitious people of the third group, comprising those who are not dependent on the produce of the village and live in the village by choice and not by necessity, have not been enumerated.

Taking into account the land use maps, figures of population, data of yield-rates of crops, and net food available, the writer has calculated the daily intake of calories per head, since the villagers are vegetarians and subsistence farmers.

Further, on the basis of food consumption per head per day, the actual intake of essential nutrient elements has been computed for each of the selected villages; and thus the deficiency of various nutrient elements has been pointed out; moreover attempt has also been made to interpret the occurrence of the various deficiency diseases. Suggestions for increasing productivity of the land, exploitation of land resources, utilization of unused lands, for the up-lift of rural economy to raise the standard of nutrition of village population have also been made.

S. Sajid Husain

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Aligarh
November, 1968

A C K N O W L E D G E M E N T S

I wish to express my sincere gratitude to Professor Mohammad Shafi, Head of the Department of Geography and Dean, Faculty of Science, Aligarh Muslim University, Aligarh, for his inspiration and valuable guidance in the preparation of this work. I am also grateful to Dr. Mohammad Anas, Reader in Geography, Dr. Niaz Ahmad Siddiqi and Dr. Muhammad Farooq Siddiqi for their helpful suggestions. I would like to express my sincere thanks to Dr. Mohammad Zaheer, M.B,B.S., M.D., Reader, Department of Social and Preventive Medicine, Jawahar Lal Nehru Medical College, Aligarh Muslim University,Aligarh, for his valuable suggestions and directions in the preparation of the Chapter on Nutritional Deficiency Diseases. Thanks are also due to Dr.U.K.Bose and the Librarian of the India Meteorological Department, New Delhi, and the Librarians of C.S.I.R. Library, New Delhi, Library of the Pusa Institute, New Delhi, Jawahar Lal Nehru Medical College Library, Aligarh Muslim University,Aligarh, Seminar Library of the Department of Geography, Maulana Azad Library, Aligarh Muslim University, Aligarh, District Libraries of Budaun and Shahjahanpur districts, and the District Magistrates and the District Land Record Officers as well as the authorities of various Tahsils who generously placed all the desired publications and unpublished records at my disposal for preparation of manuscripts. I am also indebted to the Executive

Engineers and other authorities of the Tube-well and Canal Irrigation Divisions, Department of Irrigation, Budaun and Shahjahanpur. I am thankful to the President and the Government of India who were pleased to award a scholarship to me to conduct the research work. Thanks are also due to my wife, Sabiha Khatoon Zaidi, M.Sc.(Alig.), who has whole-heartedly helped me in comparing and checking the type-written matter. I am much obliged to Mr. Mazhar Ali, Technical Assistant of the Geography Department, for taking pains in photostating the maps and diagrams and to Mr. Izharul Hasan Qureshi and Mr. Syed Asad Tariq Husaini for typing the manuscripts.

S. Sajid Husain

(Syed Sajid Husain)

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I N T R O D U C T I O N

One of the most important problems facing the country is the increasing pressure of population on land. In order to increase food production, agriculture has to be put on scientific lines and more land suitable for cultivation has to be brought under the plough. The ancient methods of cultivation with old-fashioned farm implements can not keep pace with the food requirements of the growing population. Under-developed agriculture, low productivity of the land, and the subsistence economy are related to the low economic level and poor food of the villagers. Further, their habitual residence in poor houses or huts under insanitary conditions coupled with the malnutrition have paved the way for several diseases in rural population.

In accordance with various local, physical, economic and social conditions, each region has its own problems with regard to its agriculture, socio-economic conditions and the nutritional level of the people. It is, therefore, necessary to undertake local rural surveys for a possible planning for agricultural and social improvement and for the betterment of nutritional standard of the people.

Budaun and Shahjahanpur districts extend between the parallels of 27° 28' and 28° 29' North and the meridians of 78° 16' and 80° 23' East.

The western and southwestern side is well-defined by the river Ganga[1] while the northern, eastern and southeastern borders are the political boundaries of the districts Moradabad, Rampur, Bareilly, Pilibhit, Lakhimpur and Hardoi. In the west of the Ganga, are the

1. Formerly known as the Ganges.

districts of Bulandshahr, Aligarh, Etah and Fatehgarh.[1] The maximum length of the area from west to east is 208 kilometres and the maximum width from north to south is 113 kilometres, (Fig.1).

The area possesses a simple physical landscape consisting of alluvial plain formed by the Ganga river system. It has a gentle slope from northwest to southeast in the western half of the area and from north to south in the eastern half, following the direction of the rivers. The chief rivers are the Ganga, Ramganga, Khannaut, Garra and Gomati with numerous tributaries like Mahawa, Sot, Aril and Baghul. The Aril, Ramganga and Garra are associated with a number of conspicuous meanders. Many ox-bow-lakes are also seen near the Mahawa, Aril, Kadwara, Baghul and Garra rivers. Besides, numerous seasonal and permanent lakes have various sizes and shapes; their water collected during the rainy season remains almost stagnant after the rainy season. The seasonal lakes being shallow dry up during the hot-weather season. During the season of rains they attain a huge size and sometimes they are connected with each other or with a river due to overflow and produce flood causing much distress to the rural population. The problem of poor drainage in the central low land in particular is paramount and affects adversely the agricultural land use and necessitates a careful study of the area.

The total area[2] of Budaun and Shahjahanpur districts is 9,909 sq. kilometres which includes 9,857 sq. kilometres of the rural area. The

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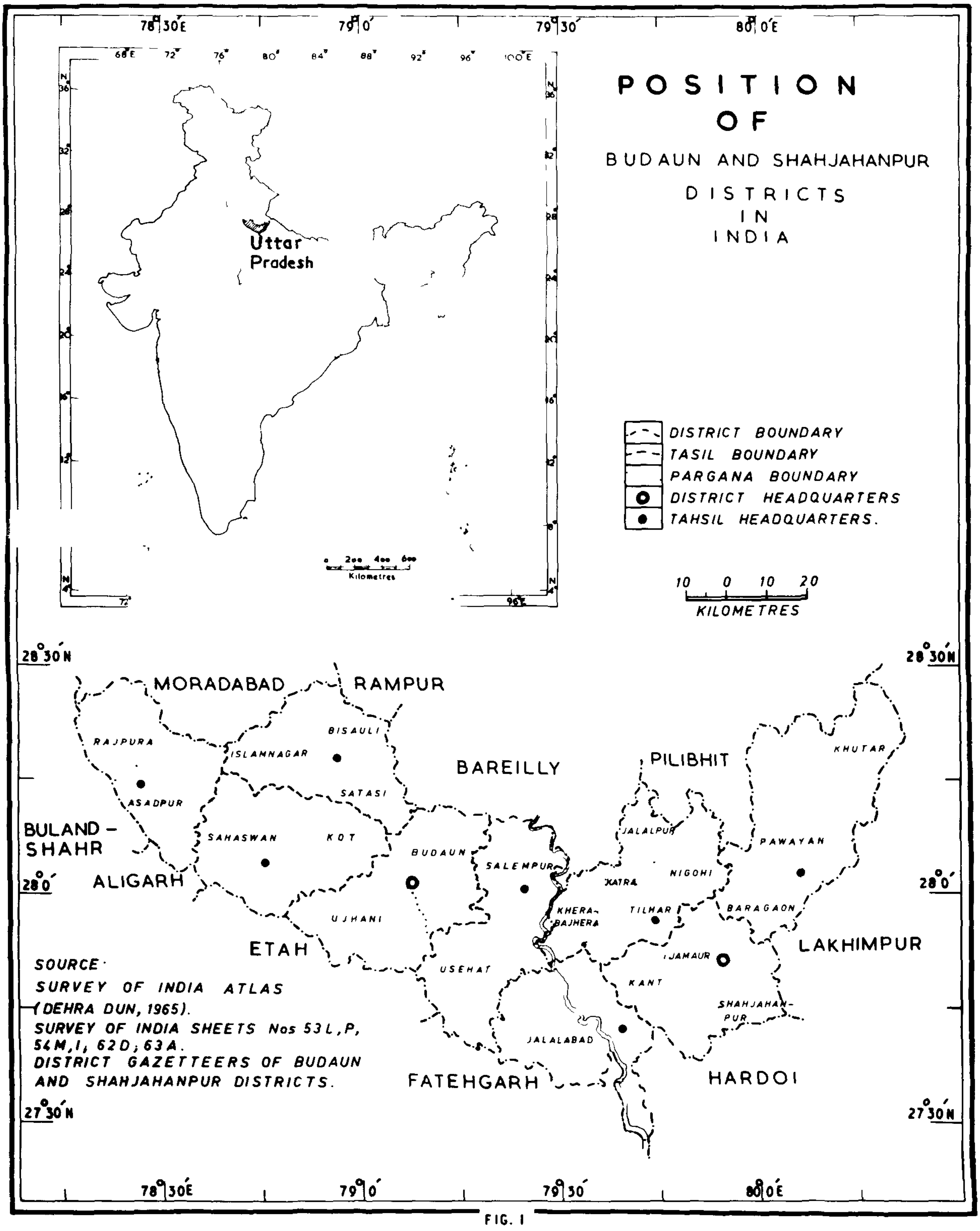
1. Formerly known as Farrukhabad.

2. Bhatnagar, P.P. - Census of India, Vol.XV, Uttar Pradesh, Part II-A, (Delhi, 1964).


POSITION
OF
BUDAUN AND SHAHJAHANPUR
DISTRICTS
IN
INDIA
Uttar
Pradesh
Kilometres
DISTRICT BOUNDARY
TASIL BOUNDARY
PARGANA BOUNDARY
DISTRICT HEADQUARTERS
TAHSIL HEADQUARTERS.
10 0 10 20
KILOMETRES
78°30'E
79°0'
79°30'
80°0'E
28°30'N
28°0'
27°30'N
MORADABAD
RAMPUR
BISAULI
RAJPURA
ISLAMNAGAR
BAREILLY
PILIBHIT
KHUTAR
SATASI
ASADPUR
BULAND-
SHAHR
SAHASWAN
KOT
BUDAUN
SALEMPUR
JALALPUR
PAWAYAN
NIGOHI
KATRA
ALIGARH
UJHANI
KHERA-
BAJHERA
TILHAR
BARAGAON
ETAH
JAMAUR
LAKHIMPUR
USEHAT
KANT
SHAHJAHAN-
PUR
JALALABAD
FATEHGARH
HARDOI
SOURCE·
SURVEY OF INDIA ATLAS
(DEHRA DUN, 1965).
SURVEY OF INDIA SHEETS Nos 53 L, P,
54 M, I, 62 D; 63 A.
DISTRICT GAZETTEERS OF BUDAUN
AND SHAHJAHANPUR DISTRICTS.
FIG. I

rural area comprises 3,866 inhabited villages and 642 uninhabited villages. The villages of over 5,000 population are only 8. The total average cultivated land is 81 to 83 per cent of the total area. The irrigated land varies from 7 to 40 per cent of the total cultivated area; the double cropped land varies from 5 to 25 per cent of the cultivated land. The 17 to 19 per cent of the whole area of the two districts is occupied by settlements, roads, water bodies, waste lands, forests, cemetery and crematory. A considerable proportion of land formerly under pasturage has been tilled on account of increasing pressure of population. The acute pressure of population is seen by the fact that these population increased by 37.6 and 20.3 per cent in 1961 as compared to that of 1901 in Budaun and Shahjahanpur districts; the increase of rural population in the two districts since 1901 is 40.8 and 18.8 per cent respectively. The population increased during last ten years is 12.8 and 12.5 per cent while the increase in rural population is 16.9 and 13.9 per cent in the two respective districts.

The total population of the two districts is 2,541,913 which includes 2,265,158 of rural population. The density of rural population (which is 91.6 and 86.1 per cent of the total population in the two districts) is 309 and 266 persons per sq. kilometer respectively.

The adequate food supply with regard to well-balanced nutrition for such a growing population needs the maximum exploitation of cultivable lands; reclamation of waste lands through scientific measures is also a necessity. This requires a careful study of every type of land. The agrarian reforms to establish a balance among several uses of rural lands, i.e., agriculture, pasturage, forestry, means of irrigation, means of transport and human habitation, need a detailed geographical study of the area; to this end an intensive survey of agricultural land use is essential. A correct knowledge of current use of agricultural lands, their yield-rates, potential production units and, in consequence, a true picture of per head per day intake of calories and essential nutrient elements suffice to ascertain actual nutritional standard of the rural population, nutritional deficiencies in their ordinary diet and the consequent diseases among, at least, a section of poor villagers. And the correlation of rural land use and health problems may point out the need for an overall improvement of agriculture in order to improve nutritional and living standard of rural population.

CHAPTER I

STRUCTURE AND RELIEF

The districts of Budaun and Shahjahanpur form part of the Indo-Gangetic Plain which lies between northern Gondwana land of Peninsular India, in the south, and the recently built Himalayan chain of mountains, in the north. The plain is 400 kilometres broad at the most, and about 2400 kilometres long. But the Gangetic trough is only 1920 kilometres long.

The north Indian plain consists of the alluvium deposited through geologic ages by great Himalayan rivers. The nature of the detritus of various sizes from big boulders to silt and clay, the arrangement of the bedding, and the general form of the surface is due to sedimentation, laid down in gently inclined layers[1] which are the principal types of river deposits.[2] These extensive deposits of very young age are the stratified alluvial accumulations. The Gangetic trough, a cynclinorial depression between peninsular India and the southern front of the Himalayas, is of post-Tertiary formation and filled up by Pleistocene alluviation.[3]

The great Austrian geologist, Eduard Suess, holds that it is a ' fore-deep ' formed in front of the resistant mass of the peninsula when the Tethyan sediments were thrust southward and compressed against them.[4] He

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1. James Geikie, Earth Sculpture,(London,1898), pp.40-41.
2. Chamberlain, Thomas C. and Salisbury, Rollin D.,Geology,(London,1909),p.18
3. Oldham, R.D., Burrard, S.G. and Glennie, E.A.,cited by D.N.Wadia, The Structure of the Himalayas and of the North Indian Foreland; Calcutta Geographical Review, Vol.II, No.1, September,1938, p.38.
4. Geology of India and Burma, Krishnan, M.S. (Madras, 1956) p. 529.

thinks it is a foredeep fronting the Himalyan earthwaves, a " sagging" or subsidence of the northern part of the peninsula as it arrested the southward advance of the mountain waves.[1] Burrard holds the view that the north Indian plains represent a rift-valley bounded by parallel faults on either side with a maximum downthrow of twenty miles.[2] The Indian geologists have not accepted this view of the origin of Indo-Gangetic depression,[3] because it has few geological facts in its support and does not confirm to geological and geo-physical observations.[4] A third and more recent view regards this region as a sag in the crust formed between the northward drifting Indian continent and the comparatively soft sediments accumulated in the Tethyan basin when the latter were crumpled up and lifted up into a mountain system. The dynamical effect of either the first or the third view would appear to be the same. The depression perhaps began to form in the Upper Eocene and attained its greatest development during the third Himalayan upheaval in Middle Miocene. Since then it has gradually filled up by sediments to form a level plain with a very gentle seaward slope.[5] Geological and geodetic data appear to support this view of the northward drift of the Indian continent and is more acceptable.[6]

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1. Wadia, D.N., Geology of India , (London, 1949) pp.3-4.
2. Burrard, S.G., On the Origin of the Himalya Mountains, Geological Survey of India, Professional Paper No.12 (Calcutta 1912),p.11.
3. Hayden, Dr.(1913) and Oldham ,R.D.(1917), cited by Wadia,D.N., Geology of India (London),1949),p.4.
4. Wadia, D.N.and Auden, J.B., Geology and Structure of Northern India, Memoirs of the Geological Survey of India,Vol.73 (Delhi, 1939),p.134.
5. Krishnan, M.S, Geology of India and Burma,(Madras, 1956)p.529.
6. Krishnan, M.S., Introduction to the Geology of India, (Madras, 1944)p.19

E.H.Pascoe and G.E. Pilgrim advocate that the Siwaliks were laid down *in the flood plains of a single river*, the Indobraham or Siwalik river, which rose in Assam and followed the present line of distribution of these deposits. But Krishnan and N.K.N. Aiyangar discuss this question and show that the available evidence points to the basin of deposition being a continuous lagoon or fore-deep formed in front of the Himalayan range. It is almost certain that Siwaliks extend down for several miles underneath the alluvial cover of the Indus and Ganga Valleys.[1] On the basis of characteristic Gondwana rocks found on the northern rims of the alluvial belt of the plain, Wadia and Auden maintain that the Archaean gneiss, the peninsular rocks, are continuous inside the plain. The continued loading of this belt by sedimentation since the first uplift of the Himalayan mountains may have accentuated the sinking of the archaean floor, but as the process of sedimentation kept pace with that of depression, there arose the great plains of India. At the same time there was a gradual southward shift of the basin with each fresh pulse of the uplift.[2]

The postulation of de Terra (1933-34) that the successive overlaps of younger over older beds from the Ganga Delta to the Northwest Panjab points to a great tilted syncline along which any master stream originally flowed to the southeast , has its own difficulties to be accepted.[3]

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1. Krishnan, M.S., Geology of India and Burma, op.cit.,pp.502-3.
2. ibid., p.502.
3. Spate, O.H.K., India and Pakistan , (London, 1954),p.33.

The sunken basin or the depression in the crust, stretching from Sind to Assam, of considerable depth, is believed to have been created as a complimentary depression to the elevation of the Himalaya. There were gulfs stretching inland far to the north along the present valleys of the Indus and the Ganga, gulf of Sind and Assam. Its filling up by the sediments, silt, clay, sand, gravel, brought down from the newly upheaved Himalayas is most notable event of sub-recent times.[1] The Indo-Gangetic alluvium contains ' a drift soil'.[2]

Beneath the alluvium of the Gangetic Plains, Tertiary strata conceals what lies below it. However, structural events determined sedimentation, and, of course, no solid rock at any depth of drilling in the north Indian plain, and presence of ' only the sand washed down by Himalayan rivers through eons of geologic times from the summit of the Himalayas' reveal the geological part played by the Himalayan rivers in the formation of the North Indian plains.[3]

The maximum depth of the alluvium is not ascertained . ' Some borings have been put down in the alluvial deposits to a depth of around 2000 feet for tapping water.[4]' The bore hole at Lucknow in Uttar Pradesh is only 1330 feet , which has not touched the rock-bottom.[5] On the basis of geodetic

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1. Wadia, D.N., The Geology and Mineral Resources of India,(Baroda, 1955), p. 51.
2. Wadia, D.N., Krishnan ,M.S. and Mukerjee, P.N., Introductory Note on Geological Foundation of the Soils of India- Agriculture and Live-Stock in India, Vol. VI,pt. I, Imperial Council of Agricultural Research, (Delhi, Jan, 1936), p. 77.
3. Hart, Henry C.- New India.'s Rivers (Calcutta, 1956),p.12
4. Krishnan, M.S., Introduction to the Geology of India, op.,cit.,pp.169-70.
5. Oldham, R.D., The Deep Boring at Lucknow, Records of the Geological Survey of India, Vol. XXIII, p. 263

data, Oldham finds the depth of the Gangetic trough to be 15,000 to 20,000 towards its northern edge.[1] Cowie criticising the above findings postulated even higher figures from the same data.[2] Recent calculations from geodetic surveys give a much lesser thickness for these lighter deposits resting on the dense Archaean bed-rock[3], and thus Glennie challenged these figures on the basis of new gravity anomaly readings obtained from different stations in the plain and calculated the maximum depth of alluvium as 6500 feet. The figure calculated by Glennie confirms with geodetic data, though not with geological fact. It can not be regarded as reliable and may well be higher.[4] The sub-montane Indo-Gangetic trough is believed to be 6,000-10,000 feet in depth.[5]

All the borings that have hitherto been made, have failed to reach the rocky bottom.[6] However, the deepest part is nearer the northern edge than the southern.[7] It becomes gradually shallower towards the peninsular margin. Its floor has a fairly regular upward slope to the southern edge.[8] The depth of the alluvium is at a maximum between Delhi and Rajmahal hills.[9] Below the North Indian Tarai region, are the bhabar plains of Upper Ganga Valley.

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1. Oldham, R.D. , The Structure of the Himalayas and of the Gangetic Plain, Memoirs of the Geol.Surv.of India, Vol. XL II,Pt.II(Calcutta, 1917),p.82
2. Cowie, H.M.. A Criticism of R.D.Oldham's Paper on the Structure of the Himalayas and of the Gangetic Plain as Elucidated by Geodetic Observations in India, Memoirs of the Geol.Surv.of India, Professional Paper No.18, (Dehra Dun, 1921),p.6
3. Glennie, E.A. Gravity Anomalies and the Structure of the Earth's Crust- Survey of India,(Dehra Dun, 1932).
4. Wadia, D.N., and Auden,J.B., op.,cit.,p. 135.
5. Wadia, D.N. , The Geology and Mineral Resources of India, op.cit.,p. 51.
6. Wadia, D.N., Geology of India,(London,1949),pp.283-84.
7. Krishnan, M.S., Indian Geological Journal, Vol. XVIII,No.4(Dec.,1943), p. 137.
8. Oldham, R.D., The Structure of the Himalayas and the Gangetic Plain, op.cit.,p.82.
9. Wadia, D.N.-Geology of India, op.cit.,p. 285.

The alluvial deposits of Budaun and Shahjahanpur district of Uttar Pradesh are calssified under two sub-divisions: old and new deposits, known as *bangar* and *khadar* respectively. These deposits in respect of their geological age, correspond with the two main divisions of the Quarternary era: the Pleistocene and the Recent. Fossils characteristics of their age, which happen only rarely, may distinghish these deposits, otherwide, no demarcation can be drawn between them.

BANGAR:

The *bangar* land occupies the higher ground and is not flooded by the rivers during the rains.[1] The prevailing material in the *bangar* alluvium is the nodular *kankar*, of carbonate of lime. The *bangar* encloses of the Pleistocene mammals Palaeoloxodon, Elephas, Equus, Rhinoceros, etc. The *kankar* , found in abundance, is the irregular concretion of impure calcareous matter. The older alluvium is distinguished by the bodular segregations of carbonate of lime[2] or calcareous concretions which are abundant in the drier regions.[3] The *bangar* land is characterised by patches of saline and alkaline efflorescences which are the result of the gentle slope of the land and the composition of the alluvium.[4] The *bangar*, above the flood level generally, possesses ' clay and sodium clay as dominant constituent , reacting with *kankar* which liberates sodium carbonate and is turned into calcium clay.[5]

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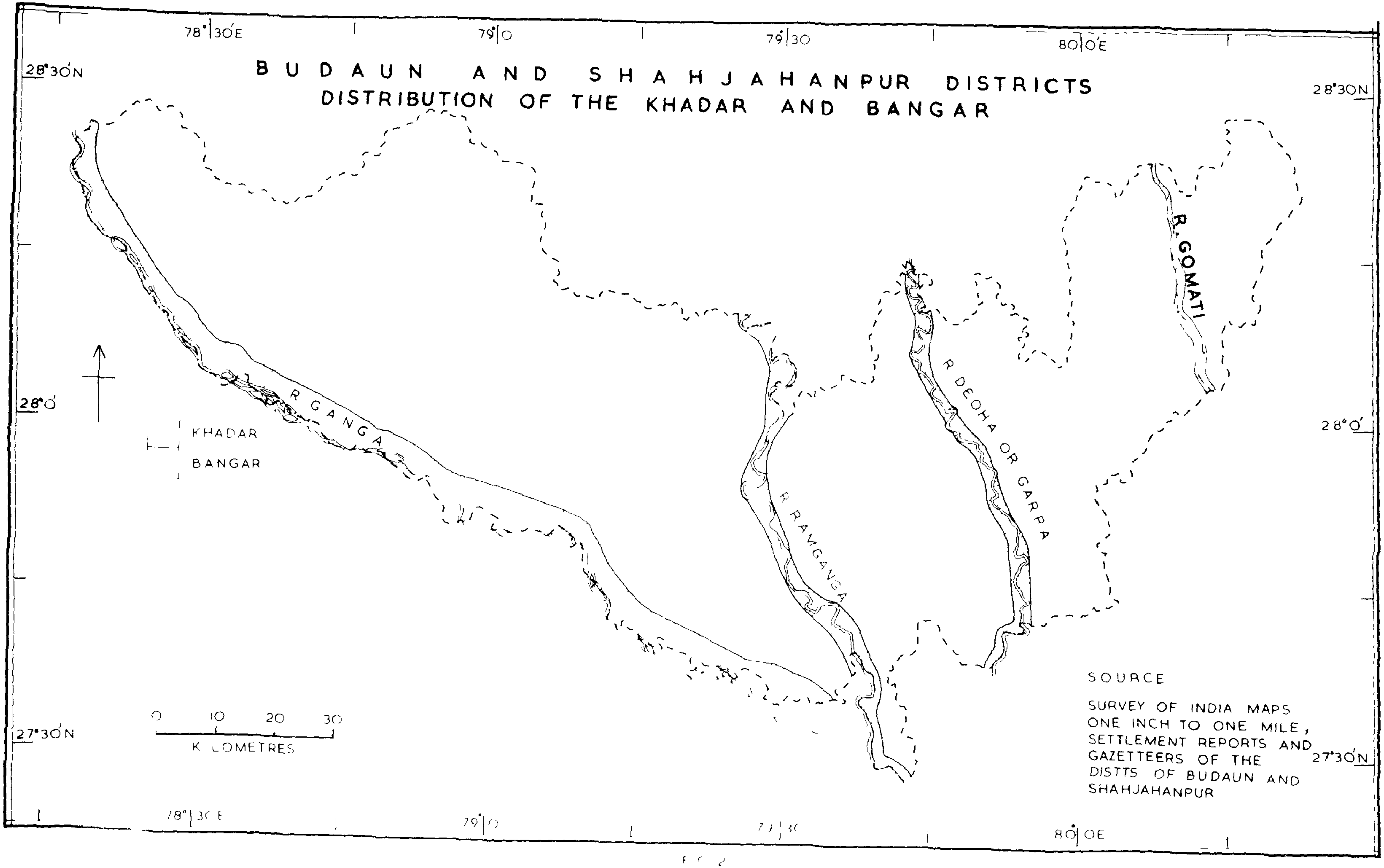
1. Shafi, M. , *Land Utilization in Eastern Uttar Pradesh*, (Aligarh, 1960),p.3
2. Rastall, R.H., *Agricultural Geology*, Cambridge Geological Series,1922, p. 100.
3. ibid., p. 160.
4. Shafi, M., op.,cit.,p.3.
5. Auden, J.B. and Roy,P.C., Report on Sodium Salts in Reh Soils in the U.P. *Rec. Geol.Survey of India*, *Professional Paper No.1* (Calcutta,1942),p.3


BUDAUN AND SHAHJAHANPUR DISTRICTS
DISTRIBUTION OF THE KHADAR AND BANGAR
78°30'E
79°0'
79°30
80°0'E
28°30'N
28°0'
27°30'N
R. GANGA
R. RAMGANGA
R. DEOHA OR GARRA
R. GOMATI
KHADAR
BANGAR
0 10 20 30
KILOMETRES
SOURCE
SURVEY OF INDIA MAPS ONE INCH TO ONE MILE, SETTLEMENT REPORTS AND GAZETTEERS OF THE DISTTS OF BUDAUN AND SHAHJAHANPUR

The *bangar* as a rule occupies higher ground than the recent *khadar*.[1] Most of the *kankar* occurrence consists of irregular small pieces of varying diametres from one centimetre to ten centimetres or more, and according to Krishnan, it is of all shapes and sizes from small grains to big lumps.[2] *Bangar* of the Ganga valley, rich in nodules of dark colour, fairly common feature in the older bed forms somewhat elevated mounds and terraces and is of Middle to Upper Pleistocene age.[3] The vertical distribution of *kankar* or travertine beds is in well-defined layers varying from pure sand beds to those composed of heavy clays of impervious layers, continuous or intermittent, within the soil.[4]

The formation of kankar concretions is due to segregation of the calcareous material of the alluvial deposits into lumps or nodules somewhat like the formation of flint in limestone.[5]

According to Medlicot and Blanford, the *kankar* nodules and the calcareous beds have been deposited from water containing a solution of carbonate of lime derived from the older rocks of various kinds or else from fragments of limestone contained in the alluvium.[6]

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1. Spate, O.H.K., *India and Pakistan*, (London, 1957), p. 34
2. Krishnan, M.S., Geology Of India and Burma, op., cit., p. 529.
3. Krishnan, M.S., Introduction to the Geology of India (Madras, 1944), pp. 169-70.
4. Wadia, D.N., Krishnan, M.S. and Mukerjee, P.N., Introductory Note on the Geological Foundations of the Soils of India; *Agriculture and live-stock in India*, Vol. VI, pt. I, Imperial Council of Agricultural Research (Delhi, Jan. 1936). p. 78.
5. Wadia, D.N., Geology of India, op. cit., p. 287.
6. Medlicot, H.B. and Blanford, W.T., *A Manual of the Geology of India*, (London, 1879), p. 393.

In some places of upland *bangar* alluvium , the *kankar* concretions outcrop over wide areas at the surface, which in other places are found at a depth as great as thirty or forty feet. In the beds of Ganga masses of calcareous tufa are aften found forming a matrix of conglomerates.

KHADAR

The newer alluvium of the Gangetic plain, called *khadar*, correspond with the Recent geologic age of the Quarternary era. The *khadar*, light coloured and often micacious, sandy and poor in calcareous matter, prevails in general in the river valleys. The animal- remains in the *khadar* are mostly identical with living species.[1] The *khadar* areas in the Gangetic plain are like ' fingers along the main stream and their sub-parallel tributaries such as the Ramganga and Gomati.[2] The *khadar* rivers annually refresh the area by their new silt, particularly in the main floodplains, which they bring from northern mountains. Nevertheless the *khadar* areas are of lower ground than that of *bangar*. The prevailing soil of *khadar* is sandy. It is almost pure sand on the banks of the Ganga, but as one proceeds away from the river, sandy character of the soil gradually decreases and is replaced by fine silt. This fine silt, called *panga* , is most fertile and is laid down by the river after the flood water has receded. But the area inundated by it is generally within two kms. from each of the

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1. Krishnan, M.S.- *Introduction to Geology of India*, op.cit.,p. 170
2. Spate , O.H.K., *India and Pakistan*, (London, 1957),p. 497.

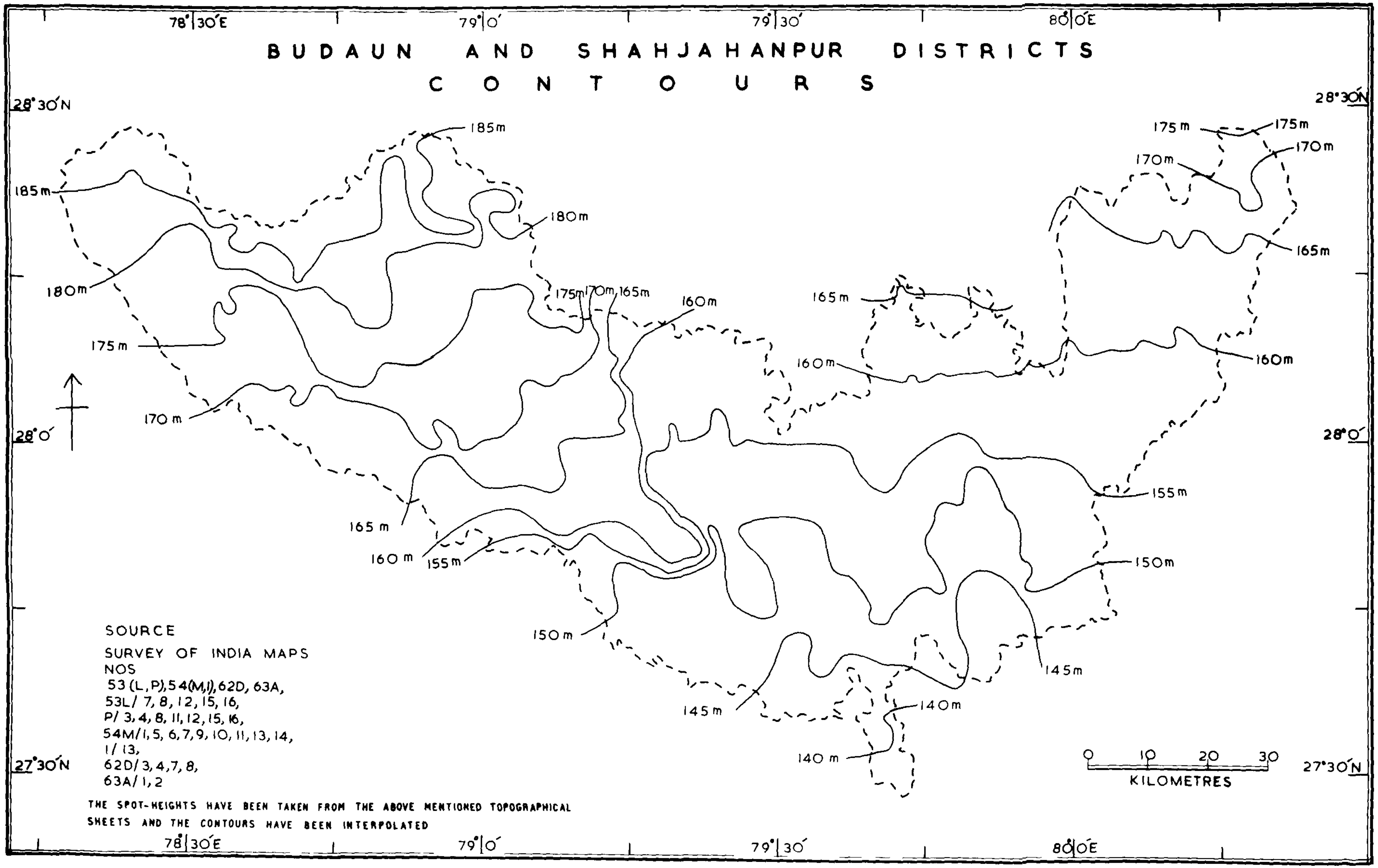
BUDAUN AND SHAHJAHANPUR DISTRICTS
CONTOURS
78°30'E
79°0'
79°30'
80°0'E
28°30'N
28°0'
27°30'N
185m
180m
175m
170m
165m
160m
155m
150m
145m
140m
0 10 20 30
KILOMETRES
SOURCE
SURVEY OF INDIA MAPS
NOS
53 (L, P), 54(M, I), 62D, 63A,
53L/ 7, 8, 12, 15, 16,
P/ 3, 4, 8, 11, 12, 15, 16,
54M/1, 5, 6, 7, 9, 10, 11, 13, 14,
1/ 13,
62D/ 3, 4, 7, 8,
63A/ 1, 2
THE SPOT-HEIGHTS HAVE BEEN TAKEN FROM THE ABOVE MENTIONED TOPOGRAPHICAL SHEETS AND THE CONTOURS HAVE BEEN INTERPOLATED

FIG. 3

banks. The *khadar* generally consists of sandy soil. The rivers have cut through *bangar* regions and formed their *khadar* areas at a lower level; the lower level is because of ' the principle that as the river gets older its deposits become progressively younger, and as the bed of the river continues to sink lower, the later deposits occupy a lower position along its basin than the earlier ones; *khadar* lands owe their origin to the *bangar* lands through the erosive action of the rivers; the remnants of *bangar* lands are subjected to erosion by the changes in the direction of the meandering river channels.[1] The *khadar* contains lenticular beds of sand and graval and peat beds, but it contains neither *kankar* nor *reh* salts. The lenses of sand and gravel, grading imperceptibly into recent alluvium, are good reservoirs of underground water.[2]

Various names of *khadar* soils are there in different parts besides the fact that they are practically all sandy with sandy silt of varying consistency. The *khapat*, *patka*, *bela* and *kamp* are some of the local names of *khadar* soils. In some places which are marshy and lie at some distance from the *khadar*, heavy matiyar clays are found, which are quite suitable for cultivation. The layers of sub-soils of the *khadar* tract are generally uniform in texture, unlike those of *bangar* tracts which vary from pure sand to heavy clay in different layers. *Khadar* soils are comparatively less retentive of moisture than *bangar* soils; but as the sub-soil water level is

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1. Wadia, D.N.—*Geology of India* (London,1926), p.251; (1953, p.391).
2. Krishnan, M.S.— *Introduction to the Geology of India,* 1944,op.cit., pp. 169-70.

relatively high , these lands need no irrigation. The amount of nitrogen and organic matter in *khadar* soils is derived from the silts of the flood water and needs renewal every year for purposes of cultivation while in *bangar* soils they are comparatively more durable. The *khadar* is deficient in calcareous constituents but is entirely protected from injurious salts of soda and magnesia accumulations and from saline or alkaline efflorescences which reduce fertility and make the soil saline; while all these injurious matters may be present in *bangar* tracts. Unlike the *khadar* areas, saline and alkaline soils are found in areas of poor drainage with high evaporation. It is remarkable that the position of the *khadar* tract shifts with the shifting of river channel, and those *khadar* tracts which thus become inaccessible to river inundation are converted into *bhur* tract, as this area is deprived of annual deposition of fine silt, *'panga'*. The *bhur* soil then cannot efficiently grow agricultural crops, and is only confined to typical crops of melons and water-melons. The continued productiveness of (*khadar*) alluvial soils is moreover assured by the deposition, during overflows, of fresh soil-material brought down from the head waters of the stream[1]. The *khadar*, consisting of a mixture of fine sand and silt, possesses usually very favourable physical composition. It has very fertile soil where there is sufficient plant food in the silt and sufficient moisture. Fresh *khadar* soils vary in accordance with local conditions. According to Glinka the principal regulator of the dynamic phenomena contributing to soil formation is the degree of

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1. Hilgard, E.W., *Soils* (New York), 1919, p. 15

humidity prevailing in the soil.[1] The interdependent factors of local orographic and hydrographical conditions are of decisive importance for the development,[2] of *khadar* soil which are well worked easily. The districts of Budaun and Shahjahanpur have a considerable area of low lying *khadar*, a tract of very diverse appearance and fertility. In Budaun district, the high cliffs form the eastern boundary of the *khadar*; below these cliffs lies a broad shallow depression which represents the old river bed. While in Shahjahanpur district the *khadar* is also known as *tarai* or lowland. The low valleys of Shahjahanpur *khadar* have been formed by a long process of erosion and deposition, the force of the current and the consistency of the soil have determined its width.

Most of the area of Budaun district has *bangar* land except the *khadar* strips of the Ganga and Ramganga in the west, south and east of the district. The *bangar* land of Budaun District continues to southeast upto the juncture of *khadar* strips of the Ganga and Ramganga in the southwest of the district Shahjahanpur. In this district the *bangar* tract embraces the greater portion than *khadar*, although the former contains many internal tracts or facets. The plain is of very fertile loamy soil, varying in depression by clayey loam, and by light sandy soils on the river banks and higher levels. The *bangar* is present here and there in large tracts in most parts, particularly in Shahjahanpur district ; the continuation of *bangar* tracts is interrupted by khadar strips or sandy banks of the rivers.

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1. The Principles of Soil Science-by Alexius A.J. de Sigmond (London, 1938), p. 148.
2. Sigmond, A.A.J. de, ibid, p. 148.

DRAINAGE

The districts of Budaun and Shahjahanpur generally form part of the alluvial plain of the Ganga which has a gentle slope from north-north-west to south- southeast and is drained well by the Ganga and its tributaries which join the river on its left bank. The surface drainage of the area constitutes a well-marked slope from northwest to southeast in the district of Budaun, while the slope is generally from north to south in the district of Shahjahanpur. The fertility of the land is directly related to the overflow of the rivers which come from Himalaya mountains. The Ganga and its tributaries which come from the Himalayas are perennial. The seasonal tributaries, however, are less important in enriching the soil as compared with perennial rivers.

The Ganga, Sot, Ramganga, Deoha and the Gomati are the main channels of drainage of the area alongwith their numerous seasonal tributaries. The different soil tracts are apparently distinguished by the character of drainage channels; <u>khadar</u> is related to the Ganga or Ramganga or Gomati rivers, while the <u>bhur</u> tract is practically devoid of any drainage and suffers occasionally from drought. The greatest of all is the river Ganga which produces no meander at all throughout its length of 149 kilometres in Budaun district in the west and south. The second largest river of the area which forms the biggest tributary of the Ganga is the Ramganga which has a meander just in the middle of the area. It is remarkable that the lesser tributaries namely Sot, Aril, Deoha, and Bahgul produce fine meanders in the area.

The course and character of the natural drainage channels mainly determine the general topography and the surface, the slope of which is evident from their courses. The district of Shahjahanpur is divided broadly into valleys of numerous streams and channels, and is gently sloping towards the south,. The rivers at places have formed ox-bow lakes. Ganga, Ramganga, Sot, Mahawa, Bahgul, Khanaut, Deoha and Gomati are perennial rivers. The Ganga khadar is generally flooded in the rainy months. The drainage of the eastern portion of Budaun is believed to have been a channel known as the kadwara , which has been silted up. The Aril river has given rise to some lakes. In the rainy season, when the river is in spate,it has a devastating effect.

The Ganga: It is the biggest river of the area and forms 149 kilometres long boundary in the west and south of the Budaun district. The total area of Budaun district is constantly liable to variations owing to the changes in the course of the river.

The level of the land, where the Ganga enters the area near village Dippur in the Rajpura pargana, is 184 metres above the sea level. Along its course from northwest to southeast, it passes through a marked gradient of 0.22 metre per kilometre. The height of the land it passes through is 158 metres at Qadir Chouk and 151 metres in the extreme southeast corner of Budaun district.

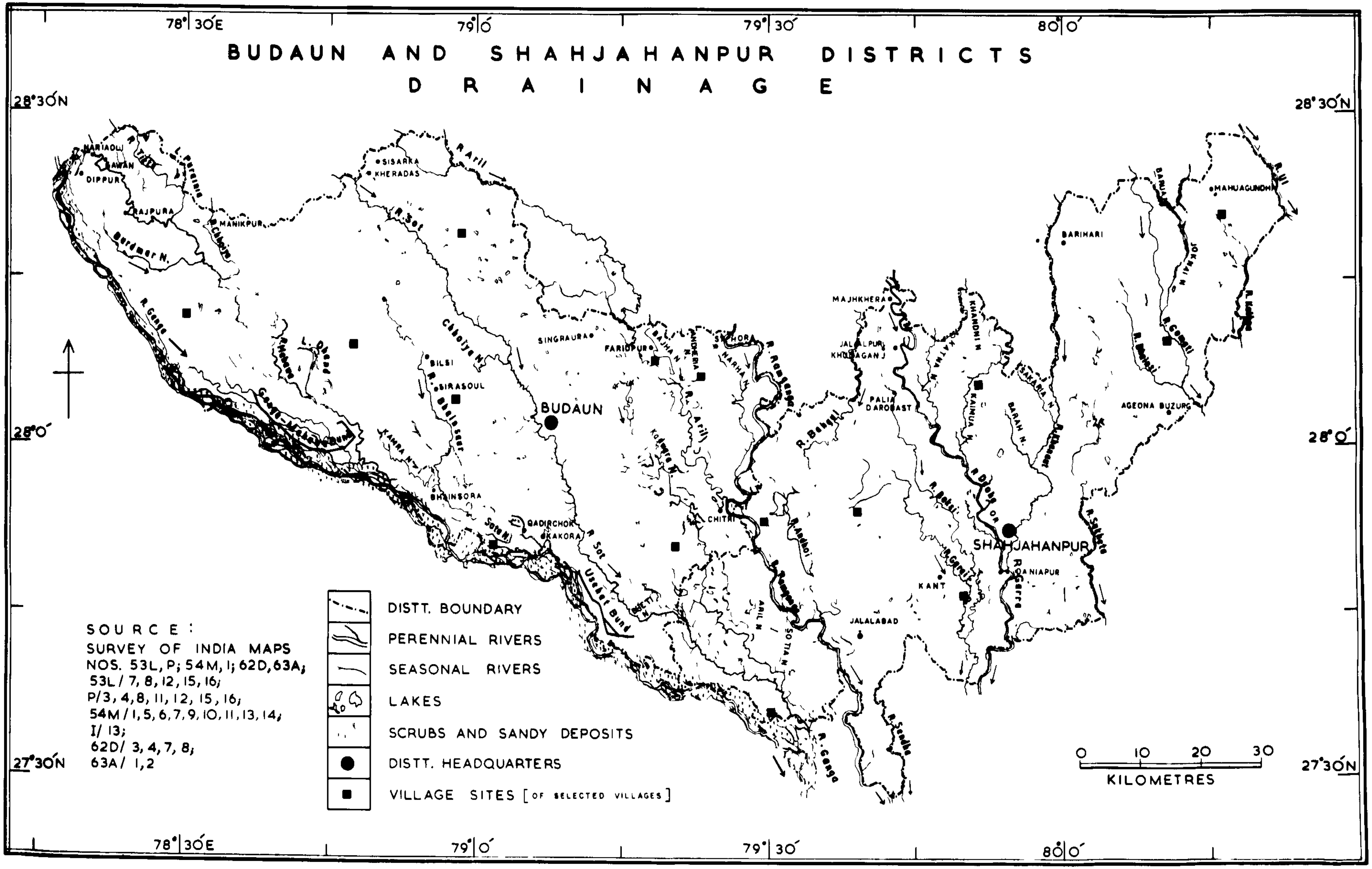
BUDAUN AND SHAHJAHANPUR DISTRICTS
DRAINAGE
78° 30'E
79° 0'
79° 30'
80° 0'
28° 30'N
28° 0'
27° 30'N
BUDAUN
SHAHJAHANPUR
R. Ganga
R. Sot
R. Aril
R. Ramganga
R. Bahgul
R. Garra
R. Sendha
R. Andhai
Usehat Bund
L. Dhand
Bardmar N.
Chhoiya N.
KAMRA N.
NARHA N.
ANDHERIA N.
BAJHA N.
KHANDNI N.
KAIMUA N.
KATNA N.
BARAH N.
SAKARIA N.
JOKHAI N.
ARIL N.
SOTIA N.
MARIAOLI
AWAN
DIPPUR
RAJPURA
MANIKPUR
SISARKA
KHERADAS
BILSI
SIRASOUL
SINGRAURA
FARIDPUR
BHAINSORA
QADIRCHOK
KAKORA
CHITRI
MAJHKHERA
JALALPUR KHUDAGANJ
PALIA DAROBAST
JALALABAD
KANT
BARIHARI
MAHUAGUNDHI
AGEONA BUZURG
NIAPUR
SOURCE:
SURVEY OF INDIA MAPS
NOS. 53L, P; 54M, I; 62D, 63A;
53L/ 7, 8, 12, 15, 16;
P/3, 4, 8, 11, 12, 15, 16;
54M/ 1, 5, 6, 7, 9, 10, 11, 13, 14;
I/ 13;
62D/ 3, 4, 7, 8;
63A/ 1, 2
DISTT. BOUNDARY
PERENNIAL RIVERS
SEASONAL RIVERS
LAKES
SCRUBS AND SANDY DEPOSITS
DISTT. HEADQUARTERS
VILLAGE SITES [OF SELECTED VILLAGES]
0 10 20 30
KILOMETRES

FIG 4

The Tributaries of Ganga:

- The upper courses of Ramganga, Gomati and Deoha have meandering and more steep gradients than their lower courses. After every flood these rivers may change their courses sideways maintaining the meanders; but owing to the general slope of the area their courses never become straight and no ox-bow lake is to be seen adjacent to their upper courses. Some of the numerous streams originate in the area, some a few miles north of the area; some of them maintain their definite courses for the most part of the year, while some change their courses, more or less, owing to backwaters of their channels.

The Mahawa: It is the third largest tributary of the Ganga in the area both in length as well as breadth. The course of the Mahawa for the most part is parallel to the Ganga. The Mahawa originates about 3 kilometres to the north of Bachhraon town of Moradabad district in the northwest of the area. After it enters into Budaum district 2 kilometres northwest of Gawan, its breadth and volume increase gradually. It receives waters of numerous seasonal small streams which generally flow from north-west to southeast. Flowing in the same direction it enters Budaun district, on a land of 186 metres above sea level near village Nariaoli, where it is nearest to the Ganga and passes through the Ganga-khadar, and where east of the Mahawa course there are many villages named with the suffix ' khadar'. And just alongwith its entry into the area it meanders. It forms a big meander at a distance of 2.4 kilometres after its entry into the area. It is also called as western Bagad Nadi here. It flows near Rajpura at 179 metres above sea level while near Sahaswan it flows at 166 metres. Ultimately it joins Ganga nearabout the middle of the length of Budaun district 2.4 kilometres west of Kachhla, a famous religious centre of annual gathering for sacred bathing in Ganga. The land along Mahawa throughout has numerous long lakes. Throughout its course in the area it forms meandering course' and forms numerous ox-bow lakes, such as in the west of Gowan, southeast of Rajpura, and further east. In the rainy season when it is flooded, it flows in two distinct channels, one of which is seasonal. The seasonal course is at a distance of about 5.6 kilometres from the main perennial course in the west. This seasonal course is also punctuated by some meanders. But as the rainy season ends, this seasonal course dries up and the deeper parts of it are converted into lakes.

Its upper and the lower parts of the course in the area are in the main khadar tract while the rest of its course is in the Bangarland. In the northwest of Sahaswan and at a distance of 5 kilometres from the Mahawa, there is a big semi-circular lake named Dhand, in addition to many small lakes. In the rainy season these lakes join and form continuous sheet of water and the water overflows in the Mahawa.

Tikta: It is also called as Eastern Bagad Nadi. Rising in the district of Moradabad it enters the area from northwest and adopting a southeasterly course it forms the district boundary of Budaun for 2.5 kilometres and then adopts an easterly course and after flowing for some distance it receives the water of a long narrow lake and that of Purainia jhil near the district boundary of Moradabad. It receives the water of the Andheria and other small seasonal channels. The lake forms the district boundary of Budaun for 6 kilometres. After it, the river joins the Mahawa on its eastern bank.

<u>The Burdmar</u>: With the name of Singli nadi it originates 4.8 kilometres northwest of Rajpura village, and 13 kilometres after its original point it becomes a strong seasonal stream and is re-named as Burdmar nadi. Flowing eastward, it finally joins Mahawa at the latter's right bank. The height of the land where it meets Mahawa is 176 metres above sea level. This is the only big tributary of Mahawa on its right bank in the area. It roughly flows in a parallel course to Mahawa, except in the last part.

<u>The Chhoiya</u>: It originates with a broken and undefined course in the Sambhal Tahsil of Moradabad district; but when it enters the area 1.5 kilometres north of village Manikpur, it attains a definite course which is from northwest to southeast. It is completely a seasonal stream. The land through which it flows is comparatively low-lying with some occasional marshes and lakes. Owing to its low lying area the tract is subject to serious waterlogging in the season of rains. This tract was formerly occupied by numerous small seasonal channels known as <u>Kadwaras</u> which discharged their water in the Mahawa. The channels have now been silted up and the area is now occupied by marshy lands. The Chhoiya river is the only remnant. In the absence of adequate drainage the area is inundated during heavy rains.

<u>The Bhainsaur</u>: It originates from a seasonal lake and flows in a southeasterly direction. It is a seasonal channel.

Upto Bilsi and Sirasaul its course is broken, mostly liable to be changed and undefined, but after it, its course is well-defined and then its course begins to be very meandering until it joins Sota nadi. It receives the water of a seasonal channel Kamra Nadi which originates from 3 long lakes and in a meandering way it meets the Bahinsaur to the northeast of village Bhainsora. It will be seen that the village Bhaisora situated on the river Bhainsaur has been named after it. The Kamra nadi is parallel to firstly Mahawa and afterwards to Ganga. After receiving the Kamra , the Bhainsaur crosses only 2 kilometres of land when it has to fall into the Sota Nadi. The Bhainsaur flows in <u>Bangar</u> tract except in its lower course.

<u>The Sota</u>: It takes its water firstly from the Bhainsaur and then flows southeastward and finally joins Ganga. It assumes enormous volume in the rainy seasons, and flows in a meandering course. In the rainy season it receives a water-channel coming from the Ganga to meet the Sota. In the rainy season it receives many seasonal channels on its both sides which come from semi-circular and very long but narrow lakes, particularly on its left side. Four semi-circular lakes on its left side are noteworthy around Qadir Chouk and Kakora. It is just possible that the upper parts of these lakes would have been the former course of the Sota Nadi. As a result every lake has a tendency to flow to the present course of Sota.The presence of a number of ox-bow lakes close to the left bank of the river clearly indicates that the river was flowing at a distance of about two or three kilometres away from its present course.

<u>The Sot or Yar-i-Wafadar</u>: This is a perennial river. It has the longest course in Bangar land where it is also called as Yar-i-Wafadar, meaning to be the ' faithful friend'. It originates at 3.2 kilometres west of Amroha in Moradabad district. Flowing from west to east and then to south-east, it forms 3.2 kilometres long boundary of the district Budaun in the northwest. It passes through the heart of the Budaun district covering the whole district from northwest to southeast. Throughout its course in the area it forms numerous meanders and receives numerous seasonal channels on its both sides. So many ferries are found in its course but most of them are not fordable during the rainy season. It enters the area 2 kilometres southwest of village Kheradas at a height of 183 metres above sea level. During its length of 118 kilometres in the area it has a gradient of one third of a meter per kilometre. It forms the boundaries of Sahaswan , Bisauli and Budaun tahsils. On its right bank, it receives a small stream Chhoiya nadi.

The southwest part of the Budaun city, named Sota, has a great slope in the southwest with an angle of about 45^{o} and a depth of 7.5 metres. The lower land is the abandoned course of the Sot river, stretching from west of the city to the south throughout. The river has now gone 540 metres away from its old course. The soil of the old course is now cultivated and is very fertile loam in which the crops of tobacco , wheat and vegetables are well-grown. In the Dataganj Tahsil it receives the water of Bheti nala which flows in 3 channels from a lake of 5.6 kilometres length.

The river enters the Shahjahanpur district where it receives numerous small seasonal streams on both sides, particularly the left side. It receives also a large seasonal stream, Kadwara , which originates and flows in the lowland of Dataganj Tahsil through numerous long lakes. Flowing in a meandering course it meets the Sot on the latter's left bank. The Kadwara receives two small seasonal streams, Aril Nadi and Sotia Nadi, the latter comes from the Ramganga. Finally it flows south of the area to meet with the Ganga . The Sot is completely of bangar land except its lower reaches, where it goes through the khadar land of the Ganga. There are fine opportunities to build canals out of the Sot river in the northwest of the area to irrigate the best loamy soil tract.

The Ramganga: The greatest tributary of the Ganga in the area is the Ramganga. It has a course from north to south till it touches the inter-district boundary of Budaun and Shahjahanpur, after which it adopts the southeastern course. It is neither parallel nor perpendicular to the Ganga. Coming into the area from Bareilly district in a wide meandering course, 2.5 kilometres northeast of village Sahora, it covers a broad course, particularly in the rainy season. Though it is a perennial stream coming out from Himalaya, and has a well-defined course , yet the area under its course is liable to continual change owing to shifting of river bed. The khadar area of the Ramganga, the width of which depends on both the volume and force of the current and the consistency of the soil particularly in floods, is a low lying tract. But, as a matter of fact, the surface of the land is subject to annual inundation depositing fine sand and silt, and is same and similar in character to that of the Ganga. The underground water-table is high. The soil consists of sandy alluvial silt and is easily well-worked as'the water itself excercises a far-reaching influence on the process of soil formation and on the changes which take place in the soil.[1]

When the Ramganga overflows its banks, it destroys many standing crops nearby, if the flood occurs in the middle or the last of the kharif season, its turbid water spreads in a thin sheet over the level ground bordering the river and deposits fine silt which usually gives rise to a soil of great richness.[2] The flood occasionally becomes destructive to village settlements. Hence the most valuable richness of the soil is at the risk of occasionally possible destruction.

The level of the land where it enters the area is 159 metres high above sea level. The gradient of the land it traverses is 0. 28 metre per kilometre from north-northwest to southeast in the area.

For most of the people, the Ramganga is the second holiest river, next to Ganga, for washing off their sins by taking bath in it religiously.Hence annual fairs of bathing are held at certain places. The river in the rainy season is not fordable and many ferries are established at the places of its shortest possible width.

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1. Ramann, E. The Evolution and Classification of Soils, translated by Whittles, C.L. (Cambridge, 1928),p.VI.
2. Phillip Lake and Rastall, R.H. , A Textbook of Geology,(London,1935),p.85

The Budaun's eastern low-land consisting of numerous lakes, small and large water-channels, marshes, other land-depressions and waterlogged patches of land, mostly represents an ancient bed of the river Ramganga and is now locally known as ' bankati' in the Budaun district.[1]

In a width of 50 to 100 metres from each of the river banks, the deposited sand is coarse and fine and is found in the hot weather season when the crops of melons, water-melons , cucumbers and vegetables are grown. After this sandy strip , the actual khadar land stretches, which is liable to move in due course of time alongwith the shift of the river channel.

So many streams, small or large, drift into the Ramganga on both of its banks, such as the Narha, the Aril, the Bahgul, etc. But remarkably most of them join Ramganga on its left side , actually following the character of the Ganga. A very fine ox-bow lake is situated at about 3 kilometres south-west of Jalalabad town (Shahjahanpur).

The Tributaries of Ramganga:

The Aril: It originates in Maithani village of Tahsil Bilari in Moradabad district. Numerous meanders are seen throughout its course in the area. It is a large tributary of Ramganga. Being a perennial river, it becomes a forceful stream in the rainy season. It has a well-defined course and a deep bed. The banks at places are broken by ravines. During the rainy season it attains large size and spreads in the adjoining low lands . It is not fordable in this season. In its upper part of the area, it drains the gently sloping land consisting of loamy soil, but in its lower part of the area, it produces waterlogging.

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1. Siddiqi, A.H.- A Regional Survey of Budaun district of U.P., The Indian Geographical Journal, Vol.XXV (Madras, Jan-- March, 1950),p. 17

Coming into the area 5 kilometres northeast of village Sisarka it forms the boundary of about 1.3 kilometres between Moradabad and Budaun districts. It again forms 13 kilometres long boundary of Rampur and Bareilly districts with Budaun , after that it leaves the area entering into Bareilly district where it is called as Pairiya nadi. It again enters the area 4 kilometres northwest of village Faridpur after forming a boundary of 4 kilometres between Bareilly and Budaun districts. It then flows southeastward entering the low land of Budaun district. The Bajha nadi from northwest and Andheria nadi from north meet the Aril. The courses of the Bajha and the Aril in this region are devious and meandering.

There are numerous long and curved lakes in the lowland, some of them are ox-bow lakes. Then it falls into the Ramganga on its right bank, 1 kilometre northeast of village Chitri.

<u>The Kadwara:</u> The bad-land topography of the low land on its western side has many seasonal channels, like the Kadwara Nadi, yet the worst drainage produces most adverse effects of waterlogging. The Kadwara originates in the upper part of this low land. The outflows of some seasonal lakes in the northern part of the lowland re-shape into a stream which draws waters of many large lakes.

It is the seasonal stream of marshy land full of numerous long and curved lakes, which all tend to promote waterlogging.

The Narha: The upper course of it originating from a seasonal ox-bow lake of Ramganga, 2 kilometres east of Ballia, Tahsil Aonla (Bareilly), is totally seasonal. Growing gradually, it receives numerous small seasonal channels on its both sides. Flowing to south, it comes nearer to Ramganga. The southern half of the course generally contains water for the most of the year; its course here is well-defined. Its breadth increases considerably in the last, before it falls into Ramganga on its right bank. However, it is a small stream, but is quite long.

The Bahgul: This perennial river originates in the Tarai of Nainital district and crossing the district of Bareilly, it enters into the area 4 kilometres northwest of Jalalpur village where it forms the inter-district boundary of Bareilly and Shahjahanpur for 12.5 kilometres north to south. The Bahgul is full of meanders nearly throughout its course, which is well-defined. The area it traverses is liable to be inundated in the rainy season. It receives many seasonal streams like the Andhoi which joins it on the right side.

The Bahgul is known as East Bahgul in its upper part in the area. It has numerous ox-bow lakes in its lower reaches in the area on eastern side. A seasonal tributary originating 3 kilometres southwest of Tilhar town, meets Bahgul on its left side. The tributary becomes a huge stream in the rainy season; its initial course for 16 kilometres remains broken and undefined for many months, but the rest 21.6 kilometres long course is well-marked. During the rainy season, the whole stream becomes full of water.

The Bahgul finally falls into the Ramganga on its left bank. It also plays an important role of the irrigation in the adjoining area for most of the year.

The Garra and the Tributaries:

The Garra or Deoha: This perennial river comes from *Tarai* region of Nainital and , crossing the district of Pilibhit in a north to south direction, it enters the area 3 kilometres north of village Majhkhera. It flows through a meandering and curved course. It receives so many seasonal and perennial rivers on its both sides, of which the Khanaut on the left bank of Garra is a perennial river,. Originating from a lake near village Palia Darobast, 6 kilometres south of Khudaganj, the Baksi nadi flows seasonally being roughly parallel to Garra, and meeting with another seasonal channel named Garai nadi, 4.8 kilometres east of town Kant, it attains a well-defined course which is commonly known in its southern half as the Gurrai nadi which receives waters of numerous small seasonal channels on both sides. Finally it joins the Garra (Deoha) on its right bank. The Katna nadi, a seasonal stream forming the inter-district boundary of Pilibhit and Shahjahanpur for 11 kilometres, flows then southward in a meandering form and falls into the Garra on its left side.

The Garra forms its own *khadar* strip, which is lesser in width than that of Ramganga. Another tributary of the Garra meeting on its left bank is Kaimua nadi, a seasonal stream which originates from a lake. It also gets the Khandni nadi on its left, which makes inter-district boundary also.

The Khanaut: The Khanaut is the large tributary of the Garra and is perennial throughout. It comes into the area from Pilibhit at 2 kilometres northwest of village Baribara and forms the district boundary for about 32 kilometres in the north of the area. Then flowing south it receives many seasonal streams on its both sides like the Sakaria nadi, Barah nadi, and others. Passing through the east of the Shahjahanpur city, it ultimately joins the Garra on its left side some 3.5 kilometres south of the city at Daniapur village. The areas near the mentioned streams have many permanent big and small lakes, particularly in the east of the Khanaut and the Garra. At the juncture of the Khanaut and Garra in the north of Daniapur village, the Garra forms very high vertical bank like cliff and has a low but wide bed, while the Khanaut does not have such a high banks anywhere and possesses very low, sloping and broad banks.

The Sukheta: Originating from a large lake, it passes through two other big lakes and flows southward. It forms the inter-district boundary of Shahjahanpur and Hardoi for about 21 kilometres from north to south. It is a seasonal stream but has a defined course.

The Gomati and the Tributaries:

The Gomati: The name of the river corresponds to the local word "ghoomti" , meaning as curving purporting to be meandering. This characteristic feature of it is found throughout its course with some distances. It originates near village Sabalpur, Tahsil Puranpur, district Pilibhit at 7 kilometres north of our area. It is not a large river in the area. It is fordable at 21 places for most of the year, except in the rainy season. Receiving the Joknai, it becomes a big river. A small stream,Barua nadi, meets Joknai. These streams possess defined courses, while banks of the Gomati are at places high and permanent. Nevertheless , its volume and effect increase in the rainy season largely. Only 2 ferries work in the rainy season. The velocity of the flowing water is great. The upper quarter of the course has high banks., while the banks of the rest course tend to be gradually lower. It is why the flood water spread much over the adjacent land of the last half course of the area. The left bank of Gomati is lower than the right bank. Both the banks of Upper Joknai are depressed while the left bank in the central and southern reaches is high. It is noteworthy that the area in between the Gomati and Joknai is mostly waste land,full of wild bushes, wild grass and some wild trees, except a few acres of land under cultivation. The *khadar* area on the right bank of Gomati and the land left of Joknai are liable to annual inundation during rainy season. It is important that the Gomati's *khadar* tract on its right side is safely cultivated in the most part of the year and there is no danger of erosion of land or deposition of coarse or infertile sand. The cultivation to its right bank shows that the river when in flood, brings fine and fertile silt and deposits it here; the far off situation of village-settlements confirm this fact. Not a single settlement is there on the left of Joknai within a distance of 2.8 kilometres from the stream which indicates devastating influence of Joknai in the rainy season in the upper part of it, while the last two third of the Joknai permits cultivation on its left upto its confluence. But a few patches of waste land in the agricultural area are also found. The Joknai forms a permanent lake also adjacent to its channel which is 4 kilometres above its confluence with the Gomati. The Gomati receives another seasonal stream, the Bhainsi, on its right bank. In its upper part the Bhainsi has a seasonal channel of 6 kilometres after which it generally contains water for a big part of the year. It has a wide course thereafter. It also overflows in the rainy season draining the large area. In its last reaches before joining the Gomati, it has adverse effects on land producing waste land mostly on the left side. At last the Gomati flows southeastward forming the boundary of the area for about 1.6 kilometres. The Gomati's course throughout is meandering, mostly in the later part of the area. The Gomati leaves the area 4 kilometres northeast of the village Ageona Buzurg.

The Kathna ; originating in the area from a small lake north of village Bansupur of Pawayan Tahsil, commands a seasonal channel upto a long lake situated on the inter-district boundary of Shahjahanpur and Lakhimpur, after which it attains a large course flowing to the south where this river has got a well-defined course and forms the inter-district boundary above mentioned for about 17.6 kilometres from north to south. At first it flows in the rainy season through cultivated land of best fertile loam, but its large course forming the district boundary, has Gadnia Reserved Forest on its left while cultivated land on its right. The last reaches of the river have to flow through the belt of forest, where the agricultural activity is at minimum. The course of the river in the area is curved but not meandering.

<u>The Ul:</u> Forming the eastermost boundary of the area, the <u>Ul</u> river flows in a broad course from NW to SE. It originates in the Reserved Forest some 4 kilometres NW before touching the area's eastern boundary. Throughout it flows through the Reserved Forest except only a few acres of cultivated land on the boundary. At the close of rainy season, it becomes a dry broad strip of sandy waste; and its remaining water is generally known to be injurious to cattle and produces fever if a man would drink.

PHYSICAL DIVISIONS

On the basis of relief and surface drainage the area may be divided into the following physical divisions (Fig.5):

I. The Khadar

II. (a) Ganga-Sot interfluve

(b) Bahgul-Deoha interfluve

III. Bhur tract

IV, (a) Sot-Aril, Kadwara interfluve

(b) Deoha-Gomati interfluve

(c) Trans-Gomati Plain

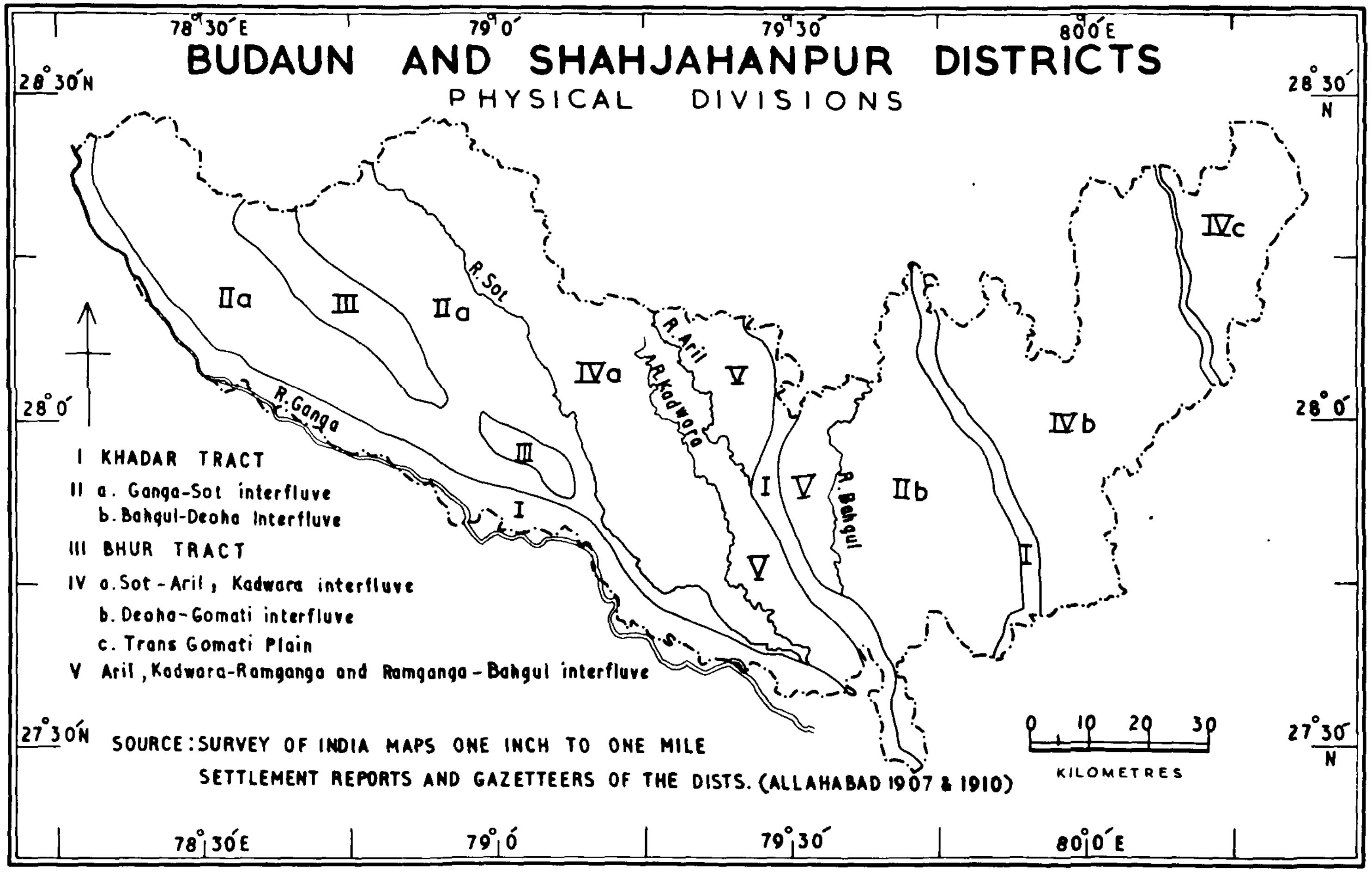
V. Aril, Kadwara- Ramganga and Ramganga- Bahgul interfluve

I. The Khadar

The width of the khadar lands varies along the rivers Ganga, Ramganga, Deoha and Gomati. The characteristic feature of the area is the abundance of moisture in the soil, which is due to nearness of the sub-soil water. During the rains, some of its parts either turn into swamps or are submerged under water; while in the winter season the soil remains almost saturated with moisture. The aggradational work of the river plays an important role in altering the nature of land. The deposition of coarse sand renders the land infertile while deposition of fine-fertile silt called 'panga' is very useful for agriculture.

II. (a) Ganga-Sot Interfluve

The area, having many small seasonal rivers and streams, has a large wasteland area in the west owing to erosive action of the streams. The sub-soil water-table remains very low, and the water level in the



78°30′E
79°0′
79°30′
80°0′E
BUDAUN AND SHAHJAHANPUR DISTRICTS
PHYSICAL DIVISIONS
28°30′N
28°0′
27°30′N
IIa
III
IIa
R.Sot
IVa
R.Aril
R.Kadwara
V
IVc
IVb
IIb
R.Bahgul
I
R.Ganga
I KHADAR TRACT
II a. Ganga-Sot interfluve
b. Bahgul-Deoha Interfluve
III BHUR TRACT
IV a. Sot-Aril, Kadwara interfluve
b. Deoha-Gomati interfluve
c. Trans Gomati Plain
V Aril, Kadwara-Ramganga and Ramganga-Bahgul interfluve
SOURCE: SURVEY OF INDIA MAPS ONE INCH TO ONE MILE
SETTLEMENT REPORTS AND GAZETTEERS OF THE DISTS. (ALLAHABAD 1907 & 1910)
0 10 20 30
KILOMETRES

FIG. 5

Mahawa and Sot rivers reduces considerably. Usar land, jungles and meadows are found in patches alongwith the cultivated land. The soil is chiefly sandy loam. The slope of the land is from northwest to southeast.

(b) Bahgul-Deoha Interfluve

In the east of the Bahgul and Ramganga, the area is not liable to floods. The gentle slope of the land is from north to south. The sub-soil water-table is low which varies from five to seven metres. The area is well-drained by some small seasonal channels. There are also a few ephimeral lakes in this region.

III. Bhur Tract

Lying in the western part of the area, the bhur tract has mostly dry sandy soil. The characteristic features of the tract are vast usar and sandy patches of land. The area is almost devoid of rivers and lakes, and where they are found, they are a good source of irrigation. The tract is sub-divided into three types of land: (i) thandi bhur -- the cultivable land, (ii) the lokharia bhur — characterized by high sandy ridges, and (iii) the urani bhur — the land occupied by wind-blown sand. The sub-soil water table is very low, being usually 7 to 10 metres.

IV. (a) Sot-Aril, Kadwara Interfluve

Being characterized by the well-drained plain, the tract occupies good loamy soil. A number of seasonal lakes and small seasonal streams are also found. Most of the area is cultivated and the waste lands are small. The eastern part tapers away to a narrow belt on account of the extension of the Ganga khadar in the south and the low-land area in the north. The sub-soil water-table is generally from 6 to 8 metres.

(b) Deoha-Gomati Interfluve

The tract consists of loamy soil and is well-drained. There are numerous seasonal and perennial lakes and streams. In the northeast of the tract, the land has numerous patches of waste land in between large areas of cultivated land. The underground water-table is generally 6 to 8 metres. Most of the canals are situated in this tract.

(c) Trans-Gomati Plain

Occupying a loamy soil tract, the area in the east and northeast is mostly under meadows and woodland. The tract is mostly tarai land, possessing a high water-table and remains generally saturated with moisture. There are numerous lakes and swamps in the tract. Wild trees and grass are also found. Most of the western part of this tract is under cultivation, while most of the eastern part is under meadows and woodlands. The seasonal river Ul which forms the northeastern boundary of Shahjahanpur district is locally known as containing poisonous water for both cattle and human being.

V. Aril, Kadwara-Ramganga and Ramganga- Bahgul Interfluve

The tract occupies a low-land area which is mostly subjected to water-logging particularly in the west of Ramganga river. The tract is occupied by a continuation of numerous lakes and streams. Many of the lakes are large and permanent. During the season of rains, the lakes expand considerably and they are usually connected with each other due to overflow. The bad-drainage conditions are a serious set-back for the cultivators.

The soil of the tract is generally clayey loam. The water-logging in the rainy season becomes so serious that means of communications are practically disrupted between the villages. The underground water-table remains generally high, varying from one to three or four metres. The presence of ox-bow lakes to the west of the river Ramganga indicates the former course of the river, which has shifted eastward.

CHAPTER II

CLIMATE

The climate of Budaun and Shahjahanpur districts is characteristically monsoonal with a rhythm of changing seasons. The changes occur with respect to the climatic elements which effectively control the whole agricultural set up and the arrangement of the crop-seasons.

The monsoon climate of the area is characterised by the two air currents of northeast and southwest monsoon, in the winter and the summer months of the year respectively.[1] The reversal of temperature conditions and the pressure of the air takes place twice in the year. The winter monsoon, being continental in origin, is mostly dry, while the summer monsoon being oceanic in origin, is moisture laden. The winter rains always remain lesser than the summer monsoon rains.

The most decisive factor for the agricultural operations in the area under review is the summer monsoon rainfall which affects the water supply round the year. The low temperatures and the gentle pressure-gradients during the winter months are accompanied by weak winds, while during the summer monsoon season, the high temperatures in the area with intensive heating of northwest India, produce steep pressure-gradients resulting in strong winds with jet monsoon stream rushing from the east-southeast in the area.

The cropping seasons--- *kharif* and *rabi* ---- are closely related to the summer and winter monsoon seasons, and the abnormal weather conditions in these seasons, particularly rainfall, have great effects upon the agricultural operations of the area.

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1. In the Gangetic plain the northeast monsoon blows from northwest, and the southwest monsoon from Southeast or east--See Harwood, W.A., *Memoirs of India Meteorological Department*, Vol.XXIV, Pt.VII & VIII, (Calcutta, 1924),p.248.

The dry part of the year, November to middle of June, is divided into the cold weather season and the hot weather season: the former corresponds with the season of rabi crops while the latter is completely dry which does not allow cultivation except few insignificant zaid crops consisting of melons, water-melons and cucumbers in dry river-beds.

The wet summer season comprises the remaining months of the year, i.e., from mid-June to October, which correspond with the kharif season. Thus the generally recognized three seasons[1] of the year [2] in the area are:

1. the cold weather season (November to February)

2. the hot weather season (March to Mid-June) and

3. the season of rains (Mid-June to October)[3]

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1. The writer has followed the generally recognized division of the year which corresponds with the agricultural seasons of the year.

2. India Meteorological Department has divided the year into four seasons:

   a) The season of the northeast monsoon;

   i) January and February— Cold weather season;
   ii) March to mid-June -- hot weather season;

   b) The season of the southwest monsoon:

   i) Mid-June to mid-September— season of general rains;
   ii) Mid-September to December— season of retreating monsoon.

3. October is the transitional period when the cessation of the summer monsoon rains occur and, with the decrease of temperature and increase of air pressure, the month receives the season's least rainfall but, as the month is included in the kharif season which mostly corresponds with the season of rains, the writer has, for the sake of convenience, included it in the season of rains.

<u>The Cold Weather Season</u> (November— February)

The temperature[1] begins to decrease in November and is lowest in December and January, but it slightly increases in February at all stations of the area (Fig. 6).

It will be seen from Fig. 6 that the mean minimum temperature in the month of November at Aligarh, Bareilly, Shahjahanpur and Hardoi ranges from 10° to 12° C. but the mean maximum temperatures at these stations range between 27° and 29° C. December registers a further decrease both in the mean minimum as well as mean maximum temperature. The mean minimum temperature ranges from 7.6° to 8.8° C. while the mean maximum shows a drop of 4° to 5° C. at all the stations (as compared to the preceding month). The days in December are less warm and the nights are cooler than November.

January is the coldest month of the year and records the lowest temperature. The mean minimum temperature in this month at above-mentioned stations ranges between 7° and 8.5° C. while mean maximum temperature ranges between 21° and 22° C. In February, the temperature begins to increase everywhere. The days are warm but the nights are cool in this month.

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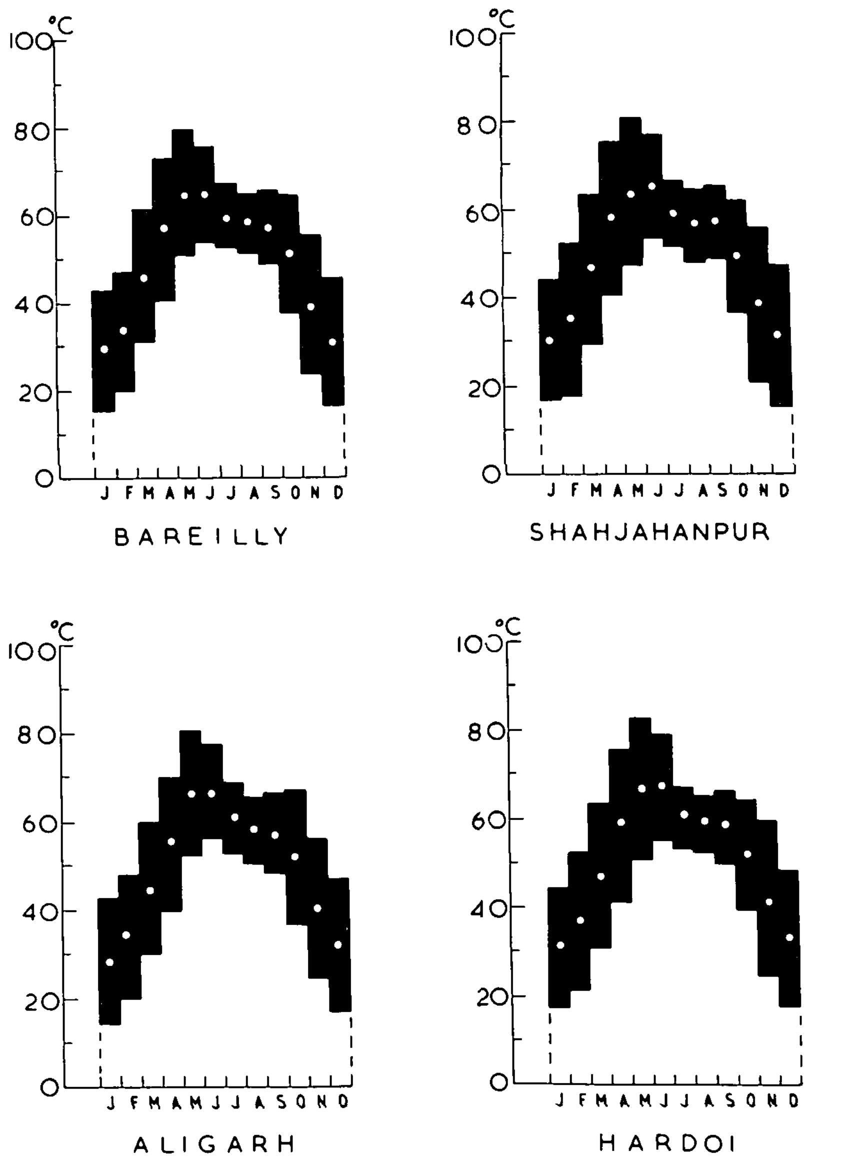
1. Temperature began to be recorded in Shahjahnpur since 1954. Prior to this there were no arrangements of temperature records at any of the stations. Although Aligarh (in the southwest), Bareilly (in the north) and Hardoi (in the southeast of the area), are at a distance of 44,20 and 38 kilometres from the area respectively, the conditions there are very similar to those of Budaun and Shahjahanpur districts. There is no other observatory in the area. The temperatures given for Aligarh, Bareilly and Hardoi in the Chapter cover an average of over sixty years. The data have been taken from the <u>India Meteorological Departments</u>,(New Delhi & Poona) and the District Headquarters and have been computed by the writer.

MEAN MAXIMUM, MEAN MINIMUM AND
MEAN MONTHLY TEMPERATURES
STATIONS BAREILLY, SHAHJAHANPUR, ALIGARH & HARDOI



SOURCES

1 NORMALS OF TEMPERATURE FOR UTTAR PRADESH STATIONS BASED ON ALL DATA UPTO 1960 INDIA METEOROLOGICAL DEPTT (NEW DELHI) UNPUBLISHED,

2 ANNUAL SUMMARY OF TEMPERATURE FOR UTTAR PRADESH STATIONS, 1961, INDIA METEOROLOGICAL DEPTT (NEW DELHI) UNPUBLISHED,

3 ANNUAL SUMMARIES OF TEMPERATURE FOR SHAHJAHANPUR, 1955 TO 1963, INDIA METEOROLOGICAL DEPTT (POONA) UNPUBLISHED

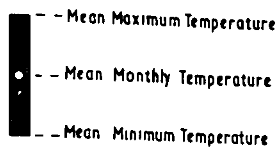


FIG 6

The westerly winds, being a cold and dry air mass, are determined partly by pressure distribution and partly by the trend of Himalayan relief.[1] They blow from northwest to southeast on the Gangetic plain.

During this season, the velocity[2] of the wind is least in November but gradually increases with the advance of the season. During the months November to February, the velocity ranges from 1.5 km. to 5.6 km.per hour at the above mentioned stations.

A significant climatic feature of this season is the occurrence of frost which adversely affects some crops. Arhar (pigeon pea), peas and gram are most susceptible to its adverse influence. There are, however, no definite records of frequency of frost. Both fog and frost[3] are liable to occur mostly in the coldest months, December and January. The fog usually occurs after a winter precipitation and lasts for a night or two; but the frost being very dry and cold lasts for two or more nights and mornings and is generally followed by precipitation.

Once the cold dry air has set in, further formation of fog or mist is inhibited. As the western disturbances move eastwards, the fog region travels along the submontane and canal districts of Uttar Pradesh,[4] including the area under review.

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1. Normand, C.W.B. Climatological Atlas for Airmen (Poona,1943),p.10
2. Based on the records of wind velocity-- India Meteorological Department (New Delhi),unpublished, computed for all data upto 1960. No record of wind velocity at Budaun and Shahjahanpur is available.
3. The fog is locally known as Kohra while the frost as 'pala' , which is cooler than the kohra . The data of air pressure, direction of winds and the number of days of fog have been taken from Normand,C.W.B., Climatological Atlas for Airmen, (Poona, 1943).
4. Technical Notes, No.1, India Meteorological Department, (Bombay,1943), p.9.

It is remarkable that the proportion of cloud as well as the relative humidity in the month of February are higher at the northern station (Bareilly) than at the southern stations (Aligarh & Hardoi).

It will be seen from Fig.8 that the amount of cloud[1] gradually increases from November to the end of February in the northern and southern parts of the area, (Aligarh and Bareilly) while the clouds in the eastern portion begin to decrease from early February as at Hardoi. It is remarkable that both clouds and the relative humidity in February are relatively high at the northern station, Bareilly, than the southern stations, Aligarh and Hardoi.

During the season, the relative humidity at 8-30 and 17-30 hours remains least in November, being 50 and 49 per cent at Aligarh, 74 and 59 per cent at Bareilly and 75 and 50 per cent at Hardoi, (Fig.8). It gradually increases to 65 and 62 per cent,and 81 and 65 per cent, and 86 and 65 per cent in January at the respective stations. In January it generally increases but again decreases in February.

The months of January and February are also characterised by some rainfall (Fig.7) which,according to some writers, occurs owing to winter depressions. Most of these depressions are supposed to originate in the Mediterranean Sea and some as distant as Western Europe and some secondaries

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1. The data of cloud proportion (Octas) and the relative humidity have been taken from the unpublished records of the India Meteerelogical Department (New Delhi); the given data cover a normal of all the years upto 1960.

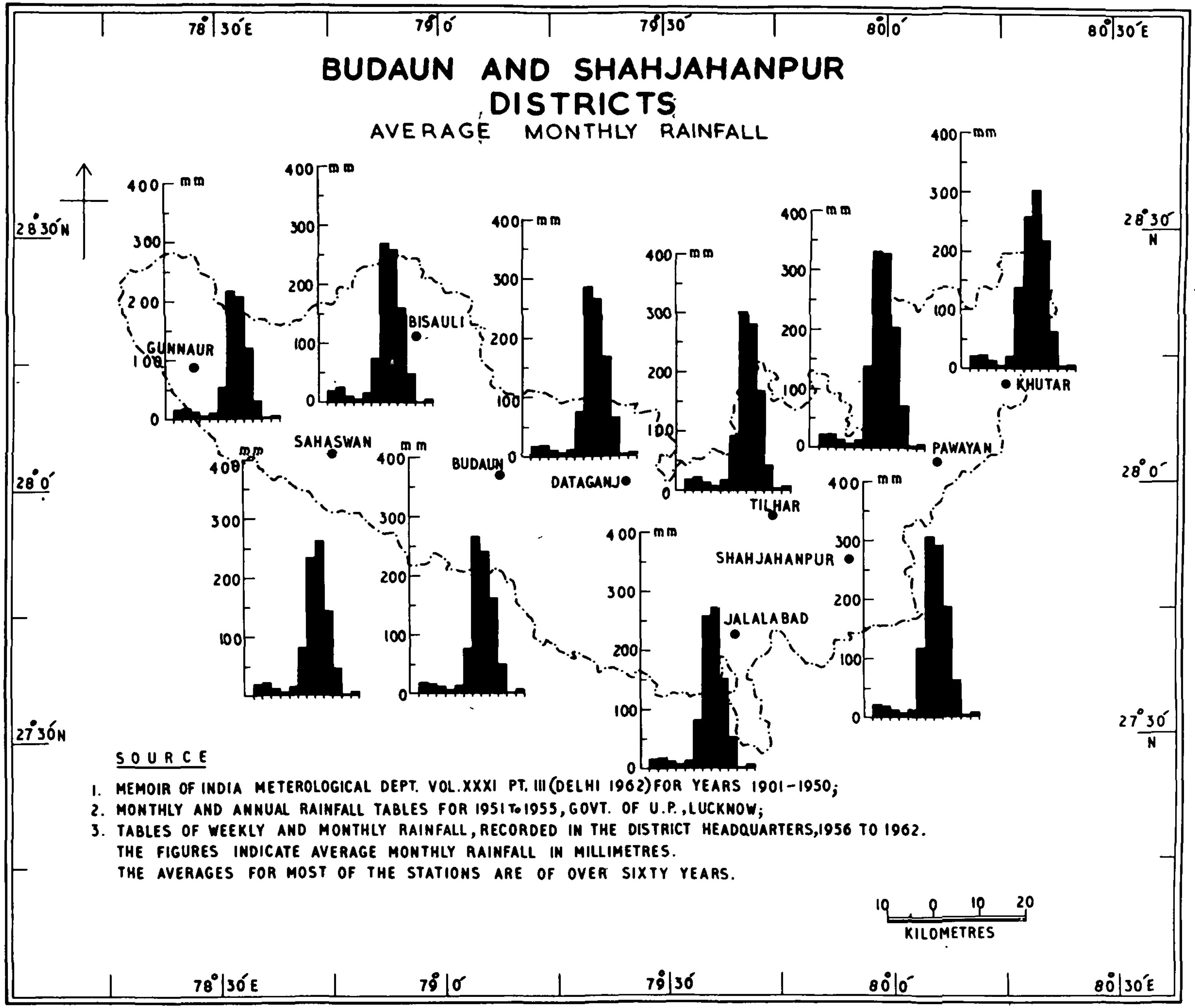
BUDAUN AND SHAHJAHANPUR DISTRICTS
AVERAGE MONTHLY RAINFALL
GUNNAUR
BISAULI
SAHASWAN
BUDAUN
DATAGANJ
TILHAR
PAWAYAN
KHUTAR
SHAHJAHANPUR
JALALABAD
SOURCE
1. MEMOIR OF INDIA METEROLOGICAL DEPT. VOL.XXXI PT. III (DELHI 1962) FOR YEARS 1901-1950;
2. MONTHLY AND ANNUAL RAINFALL TABLES FOR 1951 To 1955, GOVT. OF U.P., LUCKNOW;
3. TABLES OF WEEKLY AND MONTHLY RAINFALL, RECORDED IN THE DISTRICT HEADQUARTERS, 1956 TO 1962.
THE FIGURES INDICATE AVERAGE MONTHLY RAINFALL IN MILLIMETRES.
THE AVERAGES FOR MOST OF THE STATIONS ARE OF OVER SIXTY YEARS.
KILOMETRES

FIG. 7

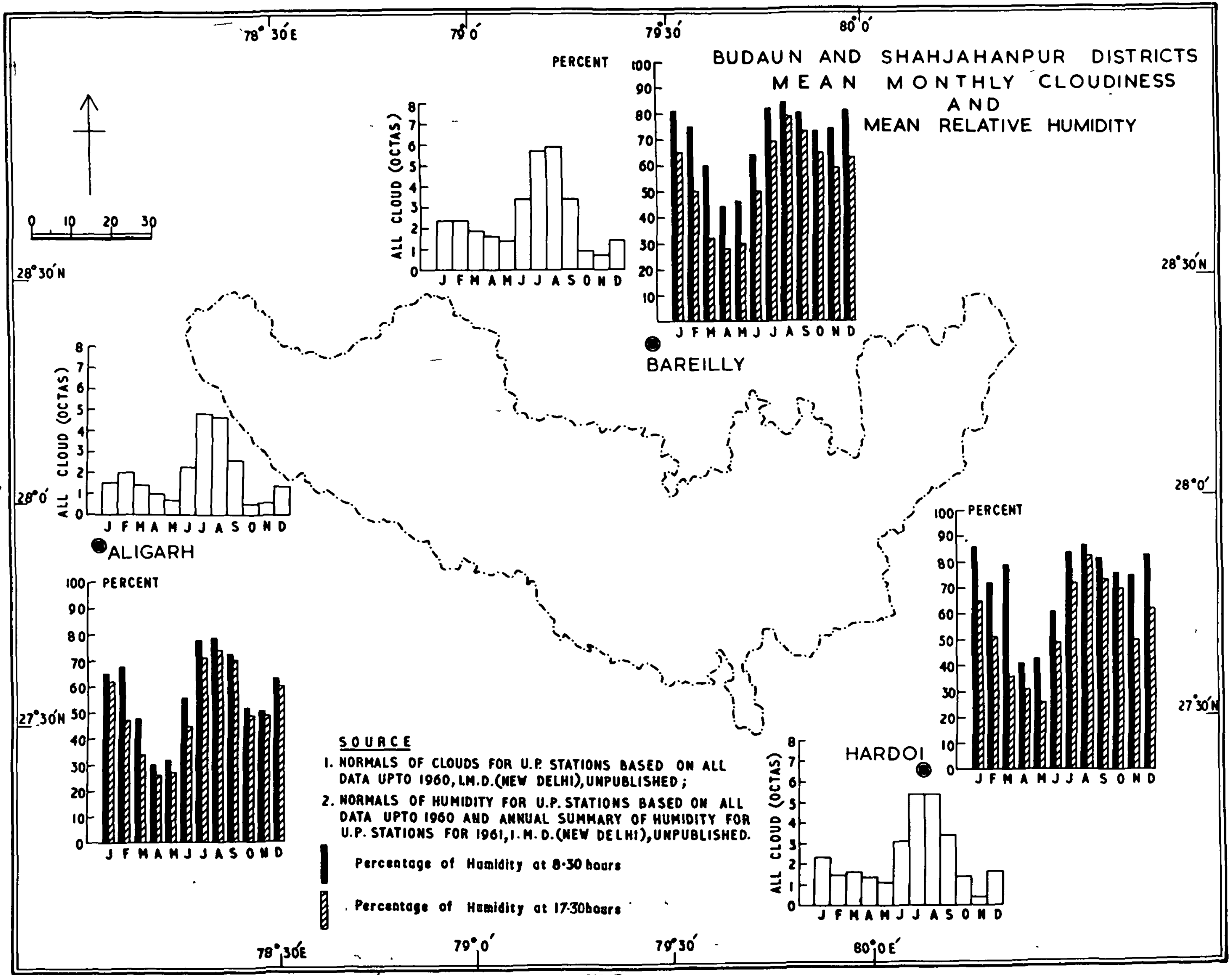
BUDAUN AND SHAHJAHANPUR DISTRICTS
MEAN MONTHLY CLOUDINESS
AND
MEAN RELATIVE HUMIDITY
BAREILLY
ALIGARH
HARDOI
PERCENT
ALL CLOUD (OCTAS)
J F M A M J J A S O N D
78° 30′E
79° 0′
79° 30′
80° 0′E
28° 30′N
28° 0′
27° 30′N
0 10 20 30
SOURCE
1. NORMALS OF CLOUDS FOR U.P. STATIONS BASED ON ALL DATA UPTO 1960, I.M.D. (NEW DELHI), UNPUBLISHED;
2. NORMALS OF HUMIDITY FOR U.P. STATIONS BASED ON ALL DATA UPTO 1960 AND ANNUAL SUMMARY OF HUMIDITY FOR U.P. STATIONS FOR 1961, I.M.D. (NEW DELHI), UNPUBLISHED.
Percentage of Humidity at 8·30 hours
Percentage of Humidity at 17·30 hours

FIG. 8

over Iran and move towards the east and come as far as the mid-Gangetic Valley.[1] Others believe that a fragment of the polar front is to be found in northwestern India- Pakistan where northwesterly continental air invades the realm of the Indian Trades. Not infrequently these westerlies and their front extend well down the Ganga Valley. Weak depressions develop along the front in northern India, providing a modest amount of winter rainfall.[2]

Still there are others who believe that the Indian monsoon is closely connected with trade winds of the northern hemisphere and say that the high pressure zones formed in the northern part of India play an important role in the origin of the winter monsoon in India.[3]

But although the winter rainfall of the western disturbance is largely confined to northern India-Pakistan, individual storms, during the passage from the Punjab to Bengal, involving three to five days, may produce very different rainfall patterns.[4] The precipitation generated by these western disturbances of the cooler seasons is usually fairly widespread and light to moderate.[5]

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1. Spate, O.H.K., India & Pakistan, (London, 1957), p.42. Kendrew, W.G., The Climates of the Continents, (Oxford, 1961), pp.157-59 and Trewartha, G.T., The Earth's Problem Climates (Madison, 1962), p.154.
2. Trewartha, G.T. — ibid., pp.151-52.
3. Voeikov, A.I. cited by Drozdov, O.A., Sorochan, O.G. and Logvinov, K.T.— Study of Monsoons by Russian and Soviet Scientists, Monsoons of the World, India Meteorological Department, (Delhi, 1960), p.121.
4. Walker, G.T. and Kameswara Rav, J.C.— Rainfall Types in India in the Cold Weather Period, Memoirs of India Meteorological Department, Vol. XXIV, pt.XI (1925).
5. Trewartha, G.T., op.cit., p.156.

The winter rains[1] are important for rabi crops. But the failure or deficiency of winter rainfall does not as much harm the rabi crops as the deficiency and delay of summer monsoon rainfall to the kharif crops.

The stations nearer to Himalaya in the area have greater winter-precipitation than others. Fig.9 shows that northern stations of Bisauli, Pawayan and Khutar receive greater precipitation in winter than the southern stations of Sahaswan, Gunnaur and Jalalabad which have the least amount of winter-precipitation.

The precipitation of the cold weather season in any year is directly related to the number, intensity and character of the storms of the period, and the precipitation occurs almost exclusively during storms or depressions.[2]

The total seasonal rainfall varies from 39.8 millimetres at Gunnaur to 56.0 millimetres at Pawayan and 57.7 millimetres at Bisauli, (Fig. 9).

The number of rainy days ranges on an average from 1 to 1.5 in a month. The number of total rainy days in the season is , however, greater at the northern stations of Bisauli and Pawayan than at the southern stations. The thunderstorms are sometimes accompanied with hail which often destroys standing rabi crops.

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1. The data of precipitation in all months and all stations have been taken from the:
   i) Monthly rainfall statistics, published for various years by the Govt.of Uttar Pradesh, (Lucknow);
   ii) Unpublished records-- Indian Meteorological Department(New Delhi) a
   iii) Unpublished records, District Headquarters of Budaun and Shahjahanpur. The averages are of over sixty years.
2. Eliot, J.,Memoirs of Indian Meteorological Department, Vol.IV,pt.VIII, (Calcutta, 1893) pp. 850-51.

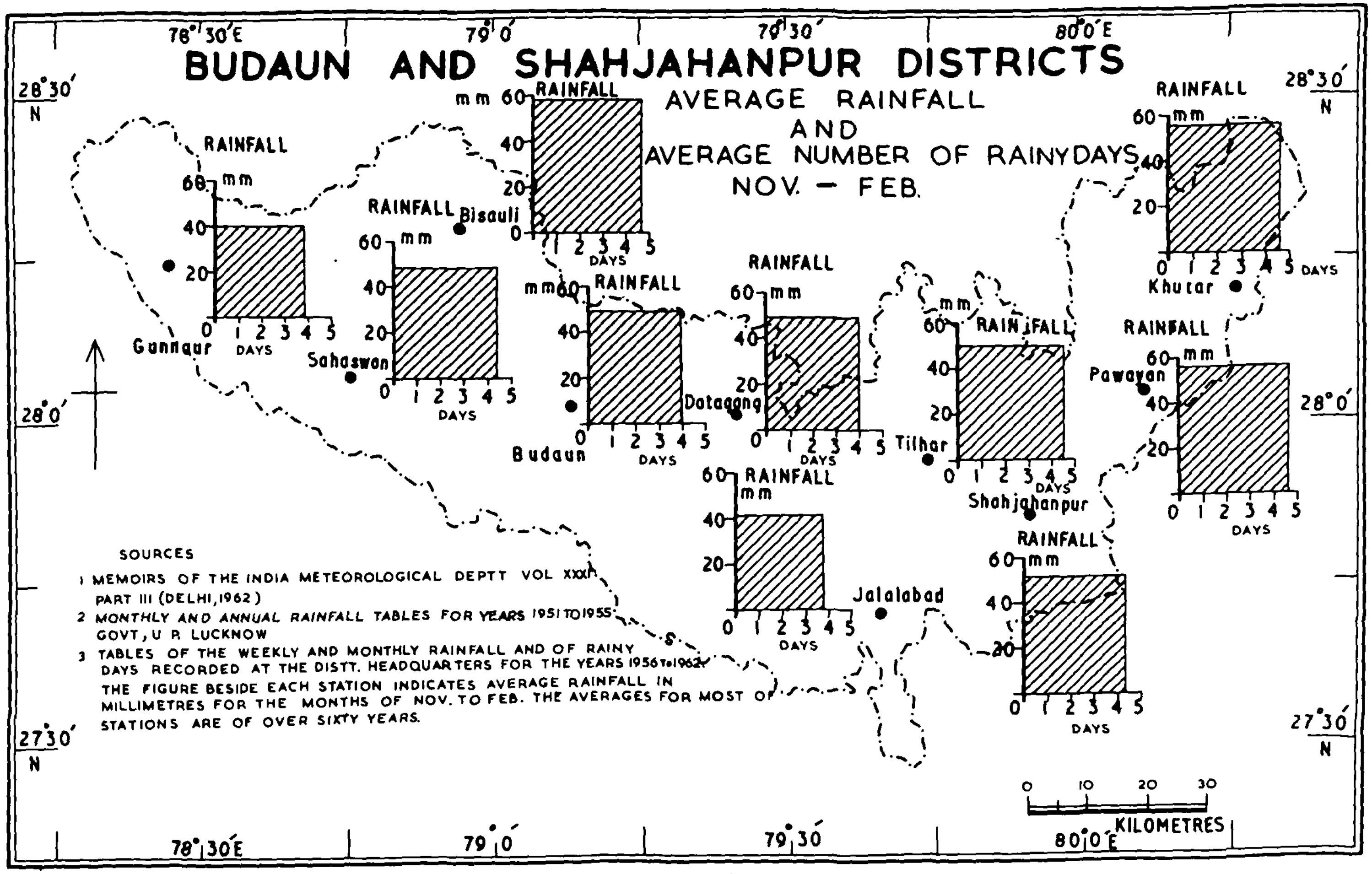
BUDAUN AND SHAHJAHANPUR DISTRICTS
AVERAGE RAINFALL
AND
AVERAGE NUMBER OF RAINYDAYS
NOV. — FEB.
RAINFALL
mm
DAYS
Gunnaur
Sahaswan
Bisauli
Budaun
Dataganj
Jalalabad
Tilhar
Shahjahanpur
Pawayan
Khutar
KILOMETRES
SOURCES
1 MEMOIRS OF THE INDIA METEOROLOGICAL DEPTT VOL XXXI PART III (DELHI, 1962)
2 MONTHLY AND ANNUAL RAINFALL TABLES FOR YEARS 1951 TO 1955 GOVT, U P. LUCKNOW
3 TABLES OF THE WEEKLY AND MONTHLY RAINFALL AND OF RAINY DAYS RECORDED AT THE DISTT. HEADQUARTERS FOR THE YEARS 1956 to 1962.
THE FIGURE BESIDE EACH STATION INDICATES AVERAGE RAINFALL IN MILLIMETRES FOR THE MONTHS OF NOV. TO FEB. THE AVERAGES FOR MOST OF STATIONS ARE OF OVER SIXTY YEARS.

FIG. 9

The Hot Weather Season (March--mid- June)

The temperature begins to increase continuously from March. In this month the mean monthly temperaturesat Aligarh, Bareilly, Shahjahanpur and Hardoi, range from 22.6° to 23.7° C. The mean minimum temperatures at these stations vary between 14.6° and 15.6° C. and the mean maximum temperatures are between 30° and 32° C.

The temperature in April increases at these stations with the mean minimum from 20.0° to 20.6° C. and the mean maximum from 35.9° to 37.9° C. The mean monthly temperature of this month ranges between 27.9° and 29.2° C. at the respective stations.

The temperature attains its climax in May. The mean maximum temperature at the above mentioned stations in May is between 39.5° and 41.1° C. and the mean minimum ranges from 24° to 26° C. while the mean monthly temperature ranges between 31.9° and 33.5° C. (Fig.6). The excessive temperature conditions often continue upto mid-June till the advent of the summer monsoon. High temperature leads to intense dryness and extremely hot weather.

The relative humidity is 30 to 44 per cent at 8-30 hours and 28 to 31 per cent at 17-30 hours in April, and 32 to 46 per cent and 26 to 30 per cent at the respective times in May. At Hardoi, it is 79 and 36 per cent respectively in March but these percentages reduce to 41 and 31 in April, and 43 and 26 at the respective times in May. The relative humidity during this season remains always lesser than in any other season (Fig.8).

The most piercing hot winds known as '<u>loo</u>' are the most pronounced westerly winds, which contain little moisture. Their strength is subject to considerable diurnal variations.[1]

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1. Shafi, M.---Land Utilisation in Eastern Uttar Pradesh, (Aligarh,1960), p. 22.

The loo blows during the day with a normal speed[1] of 8 to 9 , 4.7 and 7.4 kilometres per hour at Aligarh, Bareilly and Hardoi respectively. They are comparatively feeble at night and active during the day, being forceful in the afternoon generally from noon to 4.00 p.m. when the humidity occasionally falls to as low as 2 or 3 per cent. ~~The~~ 5 per cent Humidity of has occasionally been recorded explaining extreme dryness.[2]

The occurrence of dust storms known locally as ' andhi' also form an important feature of this season, particularly of the latter half. The 'andhi' raises a huge cloud of dust which prevails over the sky within minutes. It occurs ~~due~~ to abnormally high temperature and least air pressure with hot calm atmosphere. Generally it comes in the afternoon or the evening, and occasionally at night. It often blows with an abnormal velocity of 30 to 50 kilometres per hour. It cones with the force of a gale, perturbing people and completely disturbing their outdoor activities. ' It becomes uncomfortable to breathe and ~~much~~ very painful to the eyes[3] in the open.

It can blow down trees and thatched roofs. These winds raise clouds of dust with which the whole lower atmosphere becomes surcharged, and which give a peculiar reddish yellow glare to the sunlight, more especially in the afternoon hours. The huge mass of dust is carried generally for long distances probably as much as a hundred kilometres, reducing visibility to 3 or 4

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1. The wind speed computed on the basis of all records available upto 1960--unpublished- Indian Meteorological Department, (New Delhi)
2. Eliot, J. op.,cit., p. 162; and Blanford, H.F.-- Hot Winds of Northern India, Memoirs of India Meteorological Department, Vol.VI,No.6,(1896), pp. 162-63.
3. Hankin, E.H., On Dust Raising Winds and Descending Currents-- Memoirs of India Meteorological Department, Vol.XXII, Pt. VI, (1921),pp.571-73.

metres. The dust storm is sometimes followed by a little rainfall modifying the weather for a short period.

The rainfall in March is generally prejudicial to the ripening rabi crops. The total rainfall of the season varies from 27.5 millimetres (Gunnaur) to 40 millimetres (Khutar) while the season's total number of days of rainfall are 2 or 3 only (Fig. 10).

The high temperatures, low humidity and cloudless skies of March and April favour the ripening of rabi crops, after which they favour their harvesting, threshing and winnowing. The increased wind speed in April and early May helps much in winnowing the cereal grains. The cultivation is then stopped till the advent of the next monsoon rainfall, as the vegetative growth in the latter half season is hindered due to desiccating effect of excessive hot-dry weather conditions.

The Season of Rains[1] (Mid- June to October)

With the ' burst' of the monsoon the weather changes. In the month of June, the mean maximum temperature at Aligarh, Bareilly, Shahjahanpur and Hardoi varies from 37.9° to 39.6° C.and the mean maximum temperature ranges from 26.7 and 28.1°C. The mean monthly temperature of this month ranges between 32.4 and 33.6° C.

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1. The season of rains is locally known as ' varsha ritu' or barsat .

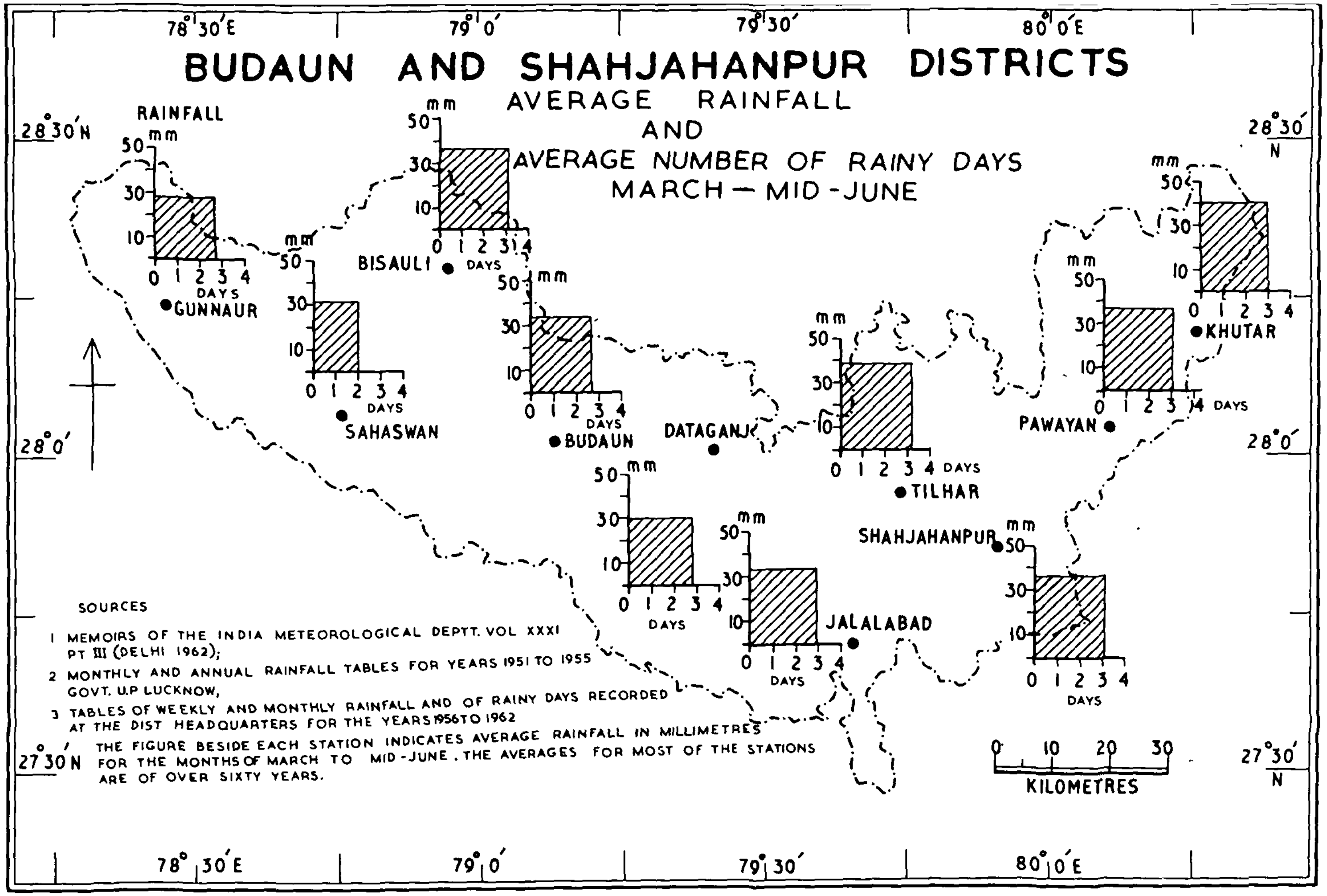
BUDAUN AND SHAHJAHANPUR DISTRICTS
AVERAGE RAINFALL
AND
AVERAGE NUMBER OF RAINY DAYS
MARCH — MID-JUNE
RAINFALL
mm
DAYS
GUNNAUR
SAHASWAN
BISAULI
BUDAUN
DATAGANJ
TILHAR
JALALABAD
SHAHJAHANPUR
PAWAYAN
KHUTAR
78°30′E
79°0′
79°30′
80°0′E
28°30′N
28°0′
27°30′N
KILOMETRES
0 10 20 30
SOURCES
1 MEMOIRS OF THE INDIA METEOROLOGICAL DEPTT. VOL XXXI PT III (DELHI 1962);
2 MONTHLY AND ANNUAL RAINFALL TABLES FOR YEARS 1951 TO 1955 GOVT. U.P LUCKNOW,
3 TABLES OF WEEKLY AND MONTHLY RAINFALL AND OF RAINY DAYS RECORDED AT THE DIST HEADQUARTERS FOR THE YEARS 1956 TO 1962
THE FIGURE BESIDE EACH STATION INDICATES AVERAGE RAINFALL IN MILLIMETRES FOR THE MONTHS OF MARCH TO MID-JUNE. THE AVERAGES FOR MOST OF THE STATIONS ARE OF OVER SIXTY YEARS.

FIG.10

Each of the mean maximum , mean minimum and mean monthly temperatures (Fig.6) has a gradually continuous fall from June to the end of August at all stations. The mean maximum temperature in September shows a little increase from August, but the mean minimum temperature records a decrease.

There is a continuous decrease of mean monthly temperature from June to October at all stations; it is also accompanied with the continuous decrease of mean minimum temperature at these stations.

The daily range of temperatures during the summer monsoon varies from 7 to 15°C. at these stations. The daily range of temperatures remains always least in August at all stations, while the range is large in June and October. The maximum range is , however, recorded in October, being about 13° to 15° C.at these stations.

During the normal monsoon months the monsoon trough running from east to west brings about general and heavy rains with prolonged raining winds. They are often in association with shallow depressions which travel slowly westwards towards the main monsoonal low.[1] The thunderstorms accompany squall winds and make the weather turbulent.

The proportion of clouds during this season is the highest of the year (Fig.8). The proportion of clouds is maximum in July and August at all stations. The southern stations of Aligarh and Hardoi get a lower amount of clouds than the northern,Bareilly. The cloud amounts in June are 2.3 to 3.3 octas at these stations. This amount increases in July, being 4.8 to 5.8 octas, and in August being 4.6 to 5.9 octas at these stations. This amount decreases in September being 2.6 to 3.3 octas.

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1. Hare, F.K.—The Restless Atmosphere , (London), 1956),p. 150.

During the season, the hailstorms, fog or frost are entirely absent. The relative humidity increases from June to August at all stations.

A comparison of relative humidity at different stations shows that in each of the months from July to October it remains generally larger in the southeast of the area (Hardoi) than the northern or western stations (Bareilly and Aligarh). Secondly, it is the largest at all stations in the months of July and August-- the period of growth of the <u>kharif</u> crops.

The jet monsoon stream, characterised by heavy and prolonged rainfall is a large scale inflow of moist maritime air. It gives widespread rains over most of the area (Fig.11). The setting in of the monsoon rainfalls is not equal in all parts of the area. The time of its occurrance at various places may also vary. The average rainfall in the season varies from west to east in the area being below 700 millimetres in the west (629 m.m. at Gunnaur) and above 1000 m.m. in the east (1075 m.m. at Pawaya

Unequal distribution of rainfall and unequal rainless periods are not uncommon. The variable rainfall conditions greatly affect the cropping conditions. Sometimes very heavy rainfall is experienced in this season; sometimes it is scanty in the time of need. For example, in the period of crops' growth-- June to August-- it was 866.8 millimetres in 1961 at Gunnaur where, during the same period, it was only 360.9 millimetres in 1962. At the same place, it was 214 millimetres in September and October in 1961-- the period of ripening of <u>kharif</u> crops , but during this period in 1962, it was 420 millimetres. The same phenomenon is seen at Pawayan where the

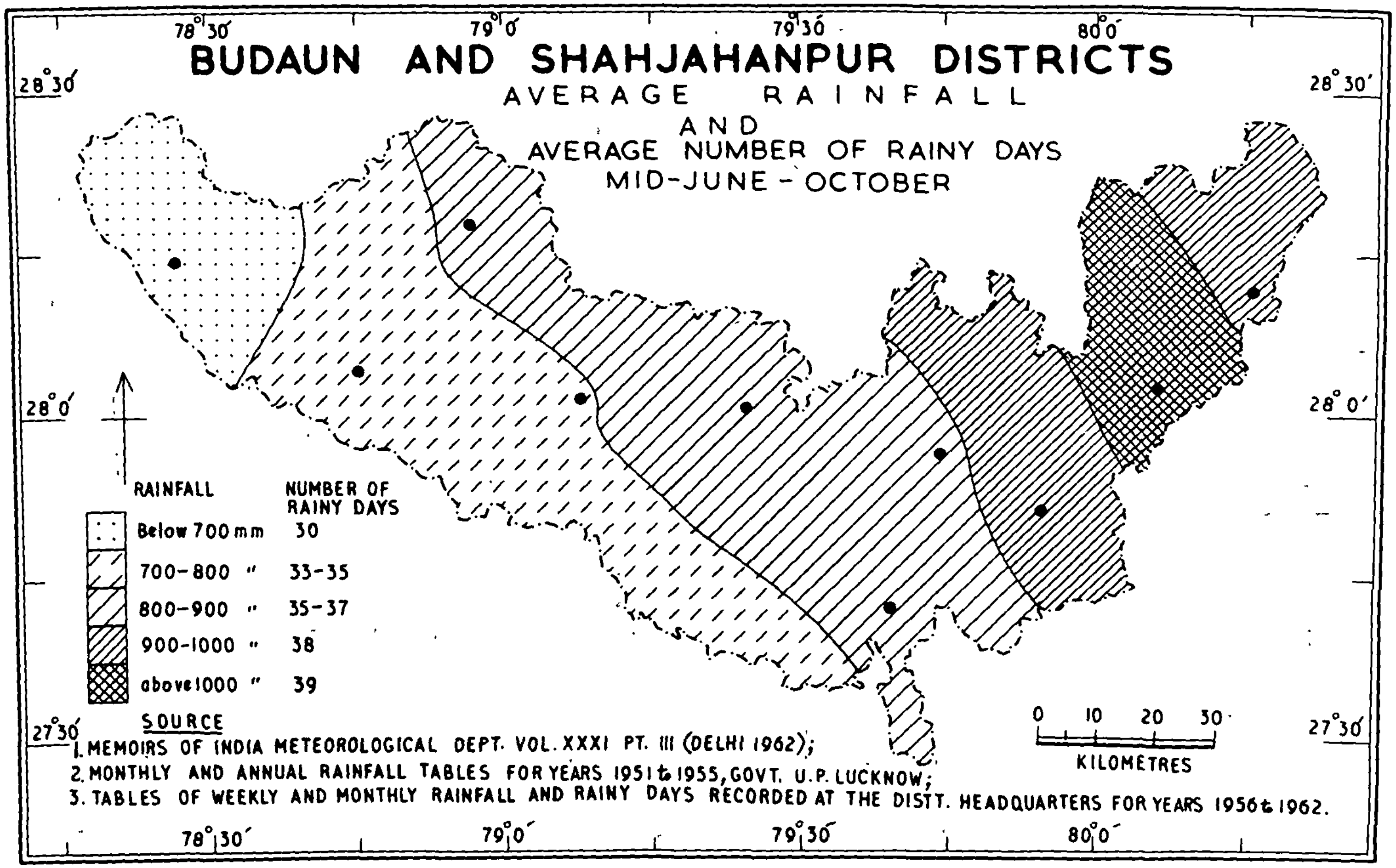
BUDAUN AND SHAHJAHANPUR DISTRICTS
AVERAGE RAINFALL
AND
AVERAGE NUMBER OF RAINY DAYS
MID-JUNE - OCTOBER
78°30′
79°0′
79°30′
80°0′
28°30′
28°0′
27°30′
RAINFALL
NUMBER OF RAINY DAYS
Below 700 mm 30
700-800 " 33-35
800-900 " 35-37
900-1000 " 38
above 1000 " 39
0 10 20 30
KILOMETRES
SOURCE
1. MEMOIRS OF INDIA METEOROLOGICAL DEPT. VOL. XXXI PT. III (DELHI 1962);
2. MONTHLY AND ANNUAL RAINFALL TABLES FOR YEARS 1951 to 1955, GOVT. U.P. LUCKNOW;
3. TABLES OF WEEKLY AND MONTHLY RAINFALL AND RAINY DAYS RECORDED AT THE DISTT. HEADQUARTERS FOR YEARS 1956 to 1962.

FIG. 11

rainfall in the months of June to August was 681.6 millimetres in 1959, but next year it was 1142.6 millimetres during these months collectively . At the same locality, it was 56.4 millimetres during September and October, 1959, while it was 996 millimetres during these months of 1960.

The total of summer monsoon rainfall at Shahjahanpur was 1323 millimetres in 1961; but the next year it remained only 659 millimetres, when the average of the seasonal rainfall is 949 millimetres. At Tilhar, the seasonal total rainfall in 1959 was 652 millimetres but in 1960, the total of the season was 1734.6 millimetres being nearly double of the seasonal average rainfall (891.5 millimetres). The seasonal rainfall was 516.5 millimetres more than average at Shahjahanpur in 1949 while in 1951 it was 335 millimetres lesser than the seasonal average.

During the rainy season, rainless periods can occasionally last for many weeks also.

The 50 to 60 per cent rainfall of the year, on an average, occurs in only July and August in the area.

The summer monsoon rainfall decreases from early September when the monsoon becomes weaker at all stations.

In October the mean monthly temperature ranges between 24.7° and 26.0° C. at Aligarh, Bareilly, Shahjahanpur and Hardoi; the mean maximum temperature lies between 31.2 and 33.7° C., while the mean minimum temperatur varies between 18.3 and 19.7° C. By the retreat of monsoon from northwest to southeast, the rainfall in October on an average is 30 and 63 millimetres at Gunnaur and Khutar, the western and eastern stations of the area.(Fig.7).

It will be worthwhile to see the frequency of annual heavy rain in the area. The frequency of heavy rainfall at different stations in the area is shown in Table I.

TABLE I

Frequency of Annual Heavy Rains[1]

Stations	No. of years	76 to 102	102 to 127	127 to 152	152 to 178	178 to 203	203 to 229	229 to 254	254 to 279	279 to 305	305 to 330	330 to 356
Gunnaur	30	20	6	4	1	1	.	1	.	1	.	.
Sahaswan	30	21	4	5	3	.	1	.	1	.	.	.
Bisauli	30	29	6	4	2	1	.	1	.	.	.	.
Budaun	30	23	6	7	1	1	.	.	.	.	.	.
Dataganj	30	33	17	9	1	2	.	.	.	.	.	.
Tilhar	30	34	12	6	.	.	1	1	2	.	.	.
Jalalabad	30	25	11	1	.	1	1	.	.	1	1	.
Shahjahanpur	30	28	16	11	4	1	1	.	.	.	.	1
Pawayan	30	32	18	8	1	2	1	1	1	.	.	.
Khutar	11	7	8	2	.	.	.	.	.	.	.	.

1. Walker, G.T.— Frequency of Heavy Rains in India, Memoirs of India Meteorological Department, Vol. XXIII, pt. VIII (Calcutta, 1924), pp. 449–50

It will be seen from the Table I that the frequency of heavy rainfalls is lesser in the first five stations (of Budaun district) lying in the west, than the last five stations (of Shahjahanpur district) lying in the east. The rainfall with an amount of 254 to 356 millimetres at each occasion is only at two stations of the Budaun district, whereas it is at six stations of Shahjahanpur district. Similarly, the occurrences of rainfall of 203 to 356 millimetres at a time are only five during 30 years at the stations in Budaun district as against twelve such occurrences during the same period at the eastern stations of Shahjahanpur district. This shows that Shahjahanpur district is wetter than Budaun and the relative wetness of this district has led to higher proportion of land being devoted to sugarcane and rice in this district than in Budaun.

VARIABILITY OF RAINFALL

Over 27 per cent is the mean annual variability in the western part of the area under review while it is below 21 per cent in the centre of the eastern half of the area. A comparison of average annual rainfall and the mean annual variability (Figs. 12 and 13) shows that the western portion where the rainfall is less , has proportionately higher tendency to deviation from the average than the eastern portion where rainfall is relatively high. The area of largest percentage of mean annual variability corresponds to the area of the least rainfall in the summer monsoon months, mid- June to October, (Fig. 11), as well as to that of least annual rainfall (Fig.12). The figures 14 to 23 express the variation in annual rainfall from the average over a period of thirty five years (1928- 1962) for stations maintaining

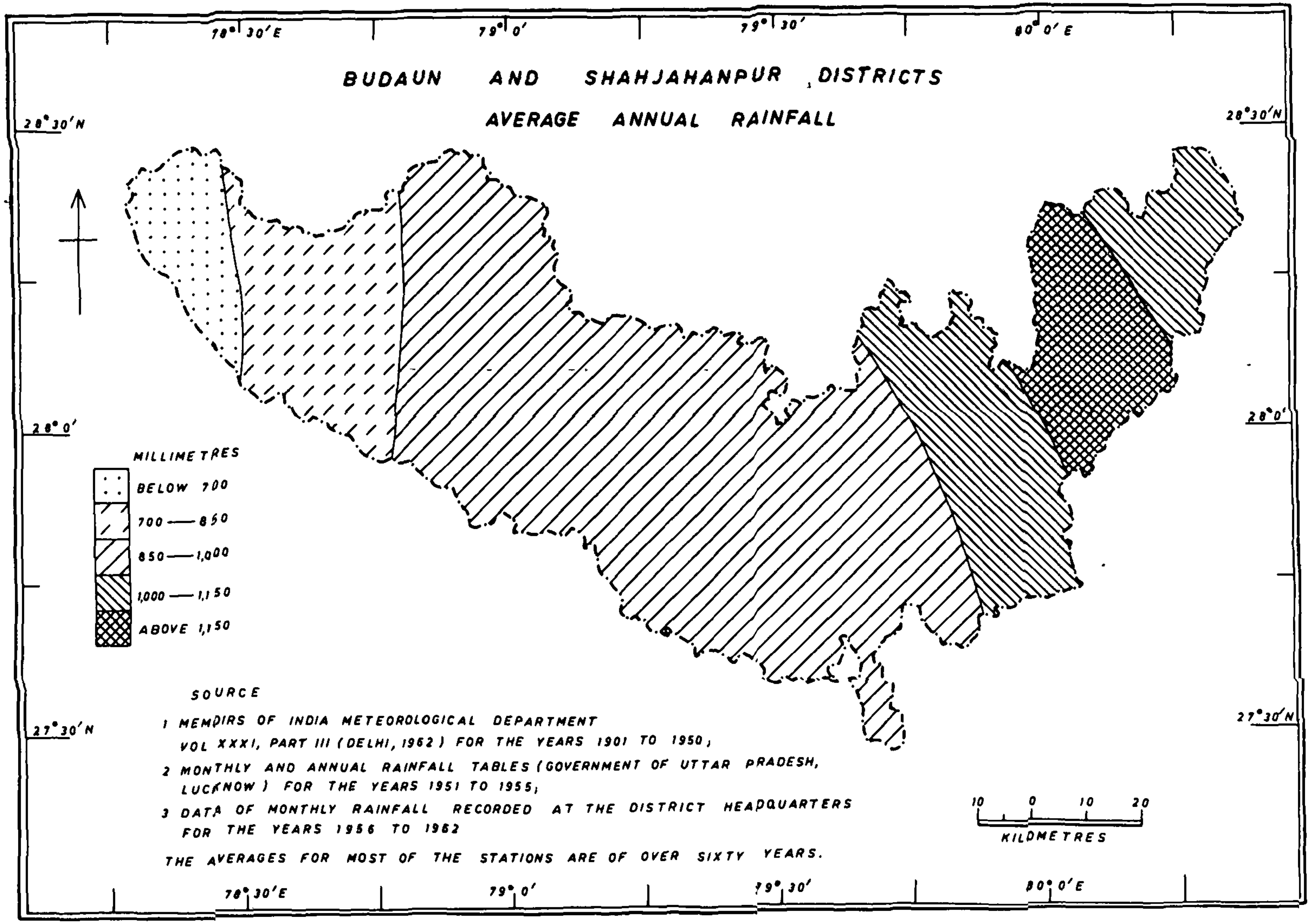
BUDAUN AND SHAHJAHANPUR DISTRICTS
AVERAGE ANNUAL RAINFALL
78° 30′ E
79° 0′
79° 30′
80° 0′ E
28° 30′ N
28° 0′
27° 30′ N
MILLIMETRES
BELOW 700
700 — 850
850 — 1,000
1,000 — 1,150
ABOVE 1,150
SOURCE
1 MEMOIRS OF INDIA METEOROLOGICAL DEPARTMENT
VOL XXXI, PART III (DELHI, 1962) FOR THE YEARS 1901 TO 1950;
2 MONTHLY AND ANNUAL RAINFALL TABLES (GOVERNMENT OF UTTAR PRADESH, LUCKNOW) FOR THE YEARS 1951 TO 1955;
3 DATA OF MONTHLY RAINFALL RECORDED AT THE DISTRICT HEADQUARTERS FOR THE YEARS 1956 TO 1962
THE AVERAGES FOR MOST OF THE STATIONS ARE OF OVER SIXTY YEARS.
10 0 10 20
KILOMETRES

FIG. 12

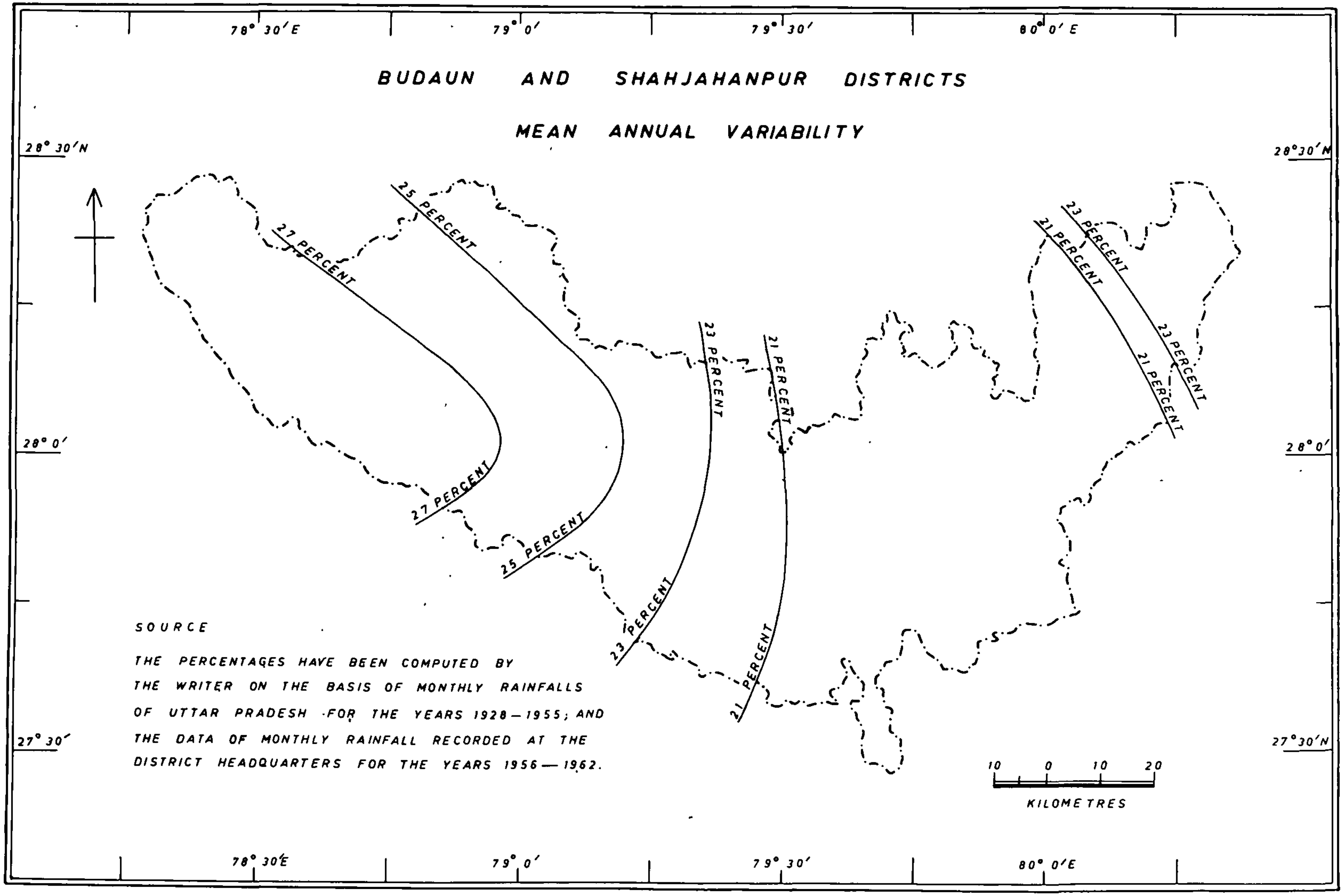
BUDAUN AND SHAHJAHANPUR DISTRICTS
MEAN ANNUAL VARIABILITY
78° 30′E
79° 0′
79° 30′
80° 0′ E
28° 30′N
28° 0′
27° 30′
28°30′N
28° 0′
27°30′N
27 PERCENT
25 PERCENT
23 PERCENT
21 PERCENT
SOURCE
THE PERCENTAGES HAVE BEEN COMPUTED BY THE WRITER ON THE BASIS OF MONTHLY RAINFALLS OF UTTAR PRADESH FOR THE YEARS 1928—1955; AND THE DATA OF MONTHLY RAINFALL RECORDED AT THE DISTRICT HEADQUARTERS FOR THE YEARS 1956—1962.
10 0 10 20
KILOMETRES

FIG.13

rainfall records. The winter rains are generally heavier when the total fall of the year is below the mean, than when the summer rains are excessive.[1] The whole of the area under review is susceptible to famine as annual variability of more than 12 per cent makes an area susceptible to famine.[2] The total rainfall at different stations has generally large variations from the average from place to place as well as from year to year, which is practically a common feature due to fluctuating character of summer monsoon rainfall. For instance, the annual rainfall in 1930 was 948.2 millimetres at Sahaswan which is above the average, while in the same year it was below annual averages at Bisauli, Gunnaur, Budaun, Tilhar, Shahjahanpur, Pawayan and Khutar being 832.6, 483.1, 718.8, 946.7, 805.9 982.5 and 1044.2 millimetres respectively. Similarly in 1940, the rainfall was 1041.4 millimetres at Pawayan, being below the average, when it was 1172.2 and 1320.6 millimetres at Shahjahanpur and Khutar, being above their averages in the same year. It was below average in 1962 at all stations except Budaun and Pawayan.

The variability of rainfall exists also from year to year at a place. If the rainfall in one year is on the average, it is liable next year to be below or above average. The annual rainfall, for example, at Bisauli was below average in 1962 while in the preceding year it was more than double of that amount (Fig.14). The rainfall at Budaun or Khutar in 1936

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1. Hill, S.A., Memoirs of India Meteorological Department, Vol.I,pt.III, op.,cit.,p. 184.
2. Blanford, H.F., Rainfall of India, Memoirs of India Meteorological Department, Vol.III, pt. I, (Calcutta, 1886-88)p.130.

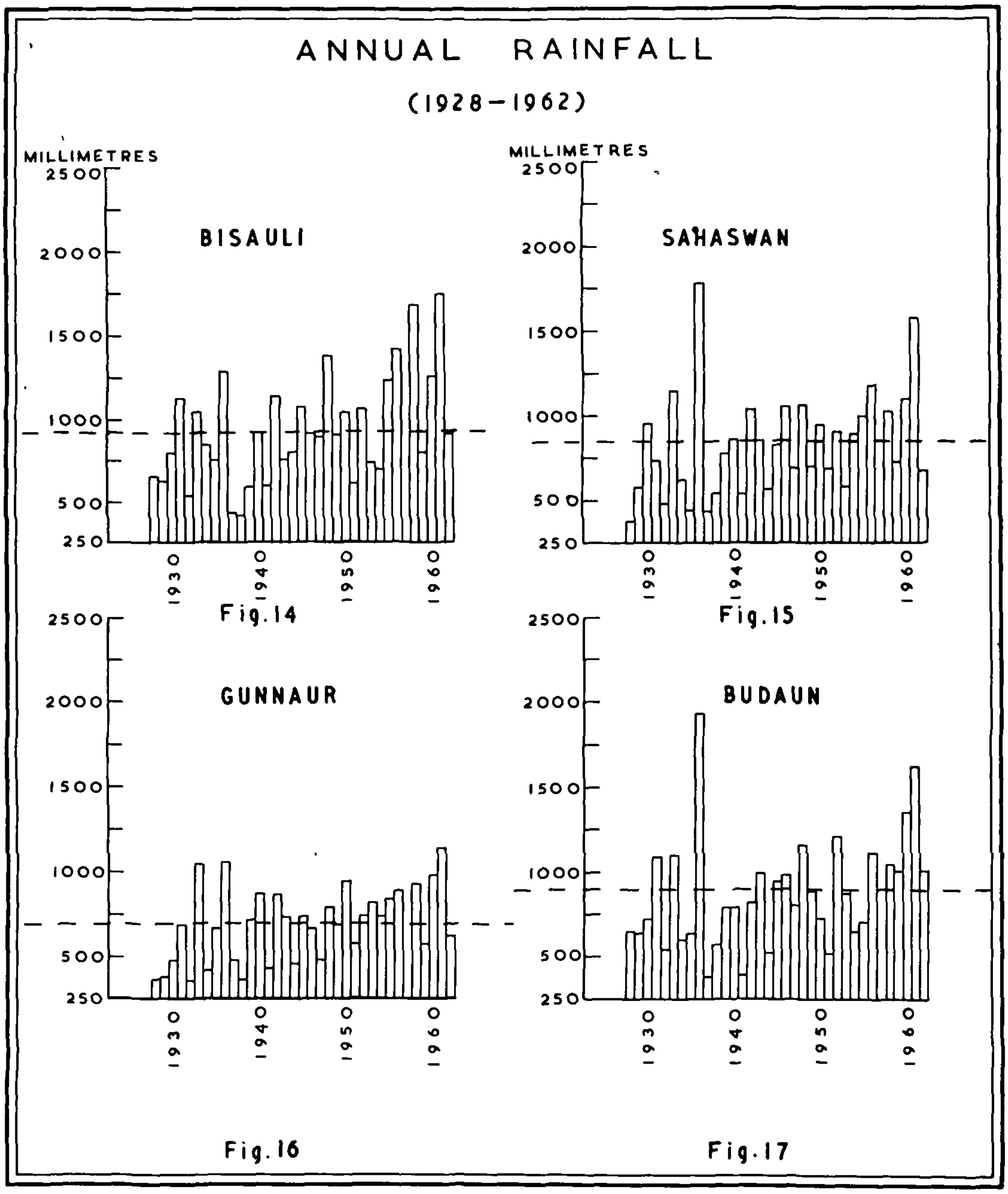

Fig. 14

Fig. 15

Fig. 16

Fig. 17

was more than three times greater than what it was in the preceding year (Figs.17 and 23). This climatic phenomenon can be seen at any rainfall station. The monsoon activity and the distribution of rainfall are liable to considerable variations.

It can be seen from Figures 14 to 23, that the rainfall in a given year is more than enough at a place causing flood conditions while at another place it may be lesser or on the average in the same year. In 1959 the rainfall was below average at all stations except Budaun where it was more than the average. The years 1928, 1932, 1937 and 1951 had experienced very deficient rainfall at all stations, while 1936, 1958, 1960, 1961 were the years of largely greater rainfall than the average at all stations, and were very wet years.

Variability in the Season of Rains

The timely distribution of rainfall is most significant from agricultural point of view. If the rainfall in the rainy season is greater than the average but most of it occurs in September, it will cause much harm to *kharif* crops and may lead to floods. Similarly, if the annual total rainfall is above the average, but the months of June and July receive insufficient rainfall, the *kharif* crops will be much affected, and the delayed sowing or the crop sown already will be physically defective in both quality and the yield. In the same way, the shortage of rainfall in August also harms the rice and sugarcane crops. 'The lower rainfall is accompanied by increased vicissitudes.'[1]

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1. Williamson, A.V. and Clark, K.G.T., The Rainfall Regions of India, *Geography*, (London, 1931), Vol.XVI, p.100.

ANNUAL RAINFALL

(1928–1962)

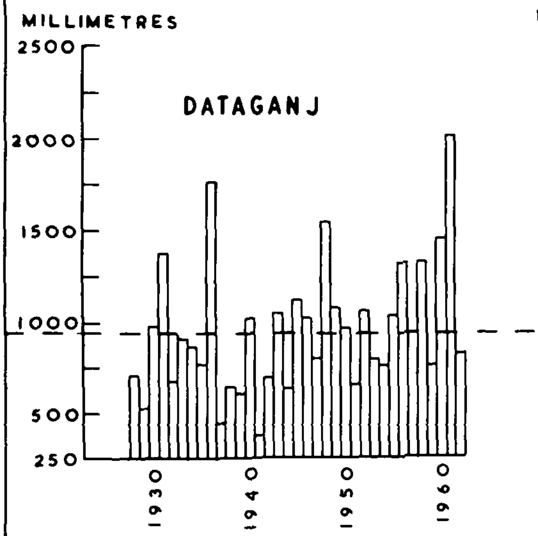

Fig. 18

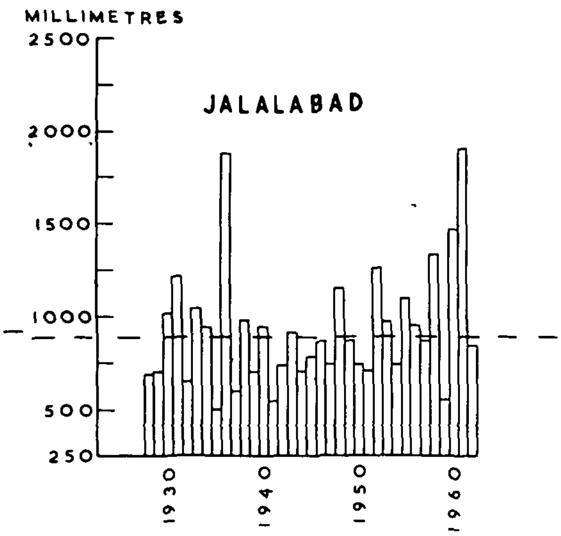

Fig. 19

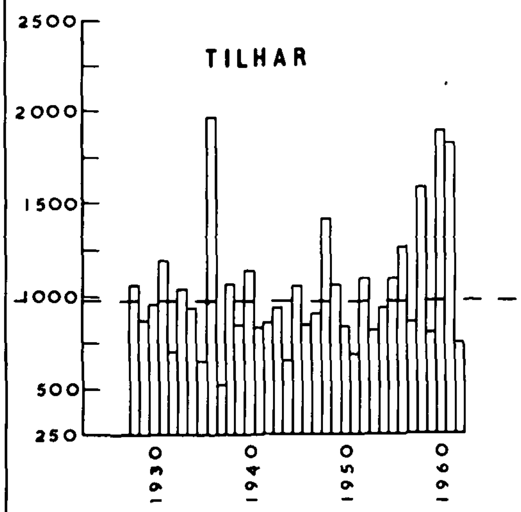

Fig. 20

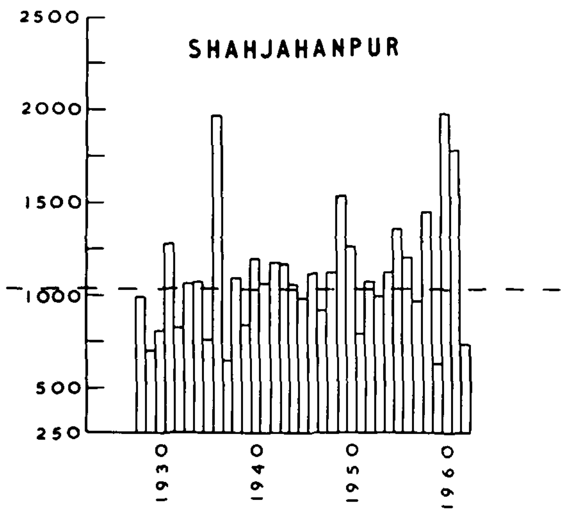

Fig. 21

C.4

ANNUAL RAINFALL

(1928 — 1962)

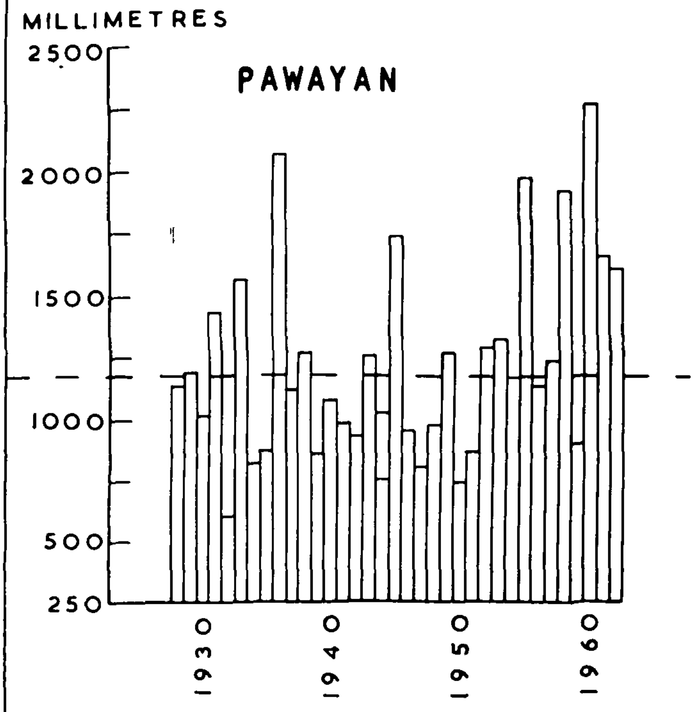

Fig. 22

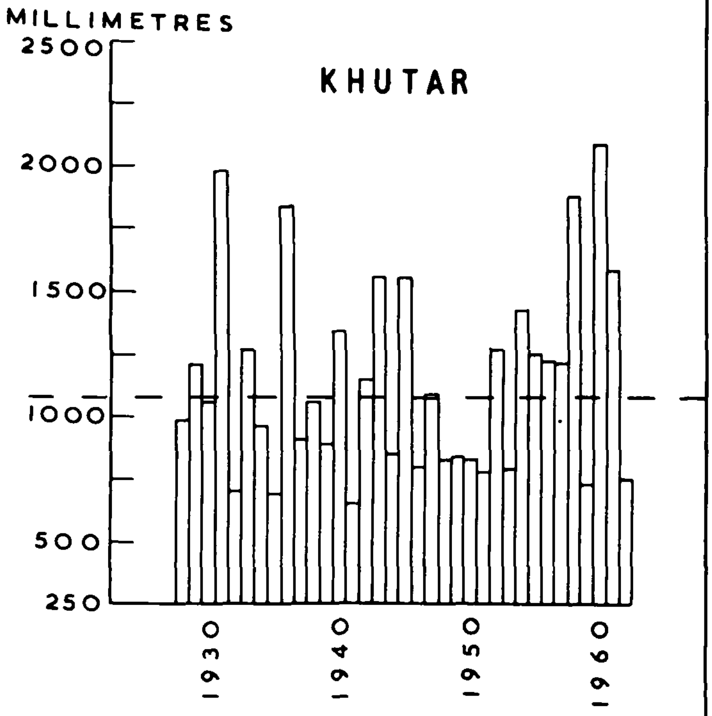

Fig. 23

SOURCE

FIGURES 14 — 23 ARE BASED ON ANNUAL RAINFALL STATISTICS PUBLISHED BY THE GOVERNMENT OF UTTAR PRADESH.

The moderate rainfall in September and October is useful for the coming rabi crops, while excess or the premature cessation of rainfall affects partly kharif crops and mostly rabi crops, ' causing postponement or restriction of the sowing of rabi crops.'[1] The September rainfall in 1941 was 33.5, 50.8, 55.6 and 55.4 millimetres at Gunnaur, Budaun, Pawayan and Khutar, while in September 1942 it was 151.9, 121.4, 121.9 and 200.2 millimetres at these stations respectively. Flooding in September 1942, provided adequate moisture for vigorous germination ~~in~~ the next rabi season; this ensured seed germination in the following rabi season in a soil wel— supplied with moisture[2].

In any case, no single value of rainfall data, however, determined, can give a complete descriptive summary, and the frequency of departures from the normal is important, but the average is particularly at fault.[3] Therefore, the mean monthly variability of rainfall for each of the wet monsoon months has been given in the Table II.

It will be seen from Table II that the percentages computed by the median values (as in Table II B) are sometimes largely different from those

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1. Clark, K.G.T., The Vicissitudes of the Summer Rainfall of the Indo-Gangetic Plain and the Assam Valley, Geography, Vol.XVII,pt.IV,1932, p. 288.
2. Parr, C.H., 'Flood Water Farming', Indian Farming Vol.IV,No.10,(Delhi, October, 1943), p. 513.
3. Crowe, P.R., The Analysis of Rainfall Probability, A Geographical Method and its Application to European Fata, Scottish Geographical Magazine , (Edinburgh, 1933), Vol.XLIX, pp. 74-75.

TABLE II[1]

	A					B				
	June % + -	July % + -	Aug.% + -	Sept.% + -	Oct.% + -	June% + -	July % + -	Aug.% + -	Sept.% + -	Oct.% + -
DISTRICT BUDAUN										
Gunnaur	73.7	40.6	44.8	78.6	100	79.4	42.3	42.7	64.4	73.5
Sahaswan	63.6	34.2	44.6	70.1	100	60.0	37.7	43.9	78.8	450.0
Bisauli	55.7	44.1	36.7	70.4	100	68.2	52.4	36.0	72.3	416.7
Budaun	56.1	29.2	42.6	58.9	100	45.5	30.6	55.5	72.5	251.2
Dataganj	57.8	37.6	36.8	64.9	100	65.9	33.5	46.1	64.6	685.0
DISTRICT SHAHJAHAN-PUR										
Jalalabad	60.0	34.3	26.7	48.8	100	57.5	35.9	28.0	47.9	166.0
Tilhar	58.8	27.9	31.3	46.3	100	81.8	29.8	29.3	48.5	381.4
Shahjahanpur	70.4	27.7	36.3	38.5	100	103.8	27.5	40.8	38.6	224.1
Pawayan	67.3	27.9	27.0	48.1	100	80.5	27.4	30.0	55.9	136.7
Khutar	62.6	41.5	29.2	51.6	100	66.3	43.9	29.2	47.2	277.6

1. The figures have been computed by the writer on the basis of monthly rainfall statistics of thirty five years (1928-62) of each rainfall station. The Monthly rainfall figures are published by the Government of Uttar Pradesh, Lucknow.
The Tables IV A and IV B have been computed on the Mean Value method and the Median value method, as given by P.R. Crowe, op., cit., pp. 77-78.

(of Table II A) computed by the Mean Value method, particularly in October, September and June. It is because the median is not necessarily at the half way point, since the range of variation is greater upwards than downwards, as against the half interquartile distance[1] or mean value method (Table A). However, the Table II B gives the maximum limit of of variability experienced particularly in October at most of the stations. There is no median value or the lower quartile value of rainfall in October at the Gunnaur station, hence the variability is 73.5 per cent in the Table (II B).

The above Tables show that the variability is least in July and August being below 45 per cent at all stations and as low as 27 per cent at some stations. It is greatest in October everywhere. It is considerably higher in September than June at the stations in Budaun district and the reverse at stations in Shahjahanpur district (Table II A). In June the variability varies from 56 to 74 per cent. In September it ranges between 39 and 79 per cent while in October it is 100 per cent at all stations (Table IIA).

Variability from the Median

The average values of rainfall are deceptive particularly when the rainfall in one of the months (or years) is extraordinarily heavy or the least or nil unexpectedly. In such cases the average value increases or decreases unjustly. An occasional high value of no great agricultural

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1. Crowe, P.R., op., cit., p. 78.

significance may raise the mean unduly, and thus the ordinary average is insufficiently sensitive and at other times over-sensitive to extreme variations.[1] The median or the middle value of rainfall, actually experienced at a station in an individual month of a long series of continuous years, is located in the middle of the series of various amounts of rainfall put already in ascending or descending order, and this principle formulated by Crowe is a more useful indicator of rainfall probability to demonstrate implications of variability.

The variability of rainfall from June to October, therefore, has been analysed with the Median Value Method, comprising all the rainfall stations of the area under review.

The distribution of monthly rainfalls of the wet monsoon months over a period of thirty five years for all the stations has been shown in figures 24—33. It is noteworthy that the stations of Figures 24-27 are situated in the area of maximum annual variability as against the stations of figures 31--33 which possess least annual variability. These groups of stations have varying quartile- and median- values in the same month. Yet all the rainfall dispersion diagrams (Figs.24--33) show similarity of variabilities in various months. These diagrams reveal that the months of maximum rainfall are July and August all over the area. The variability for June, being

1. ibid.,pp. 73-74.

RAINFALL DISPERSION DIAGRAMS

JUNE – OCTOBER

(1928 – 1962)

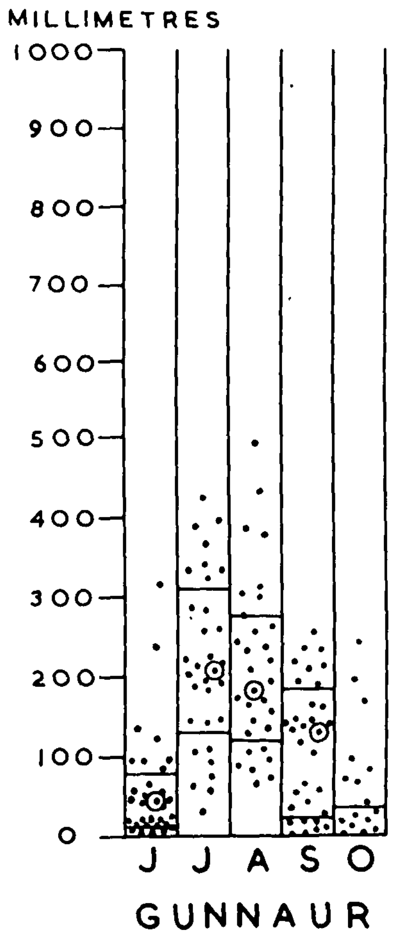


Fig. 24

Fig. 25

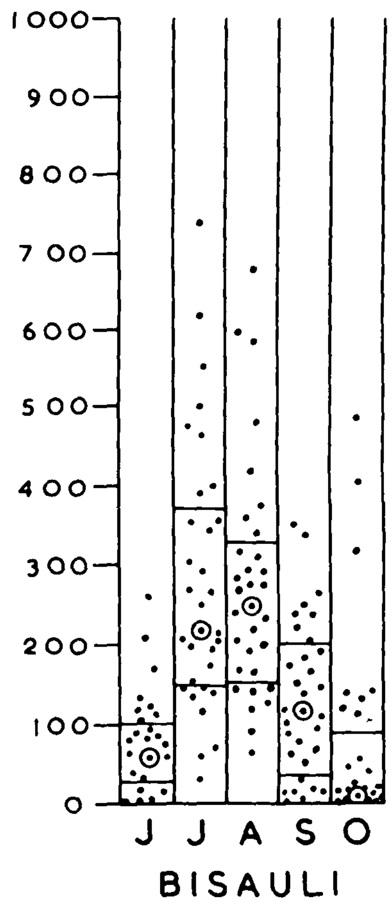


Fig. 26

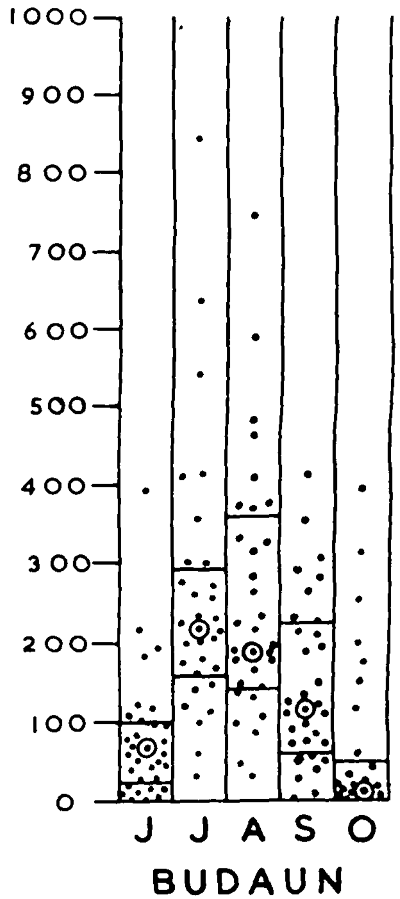


Fig. 27

greatest at Shahjahanpur, 103.8 per cent (Table IIB), is everywhere critical due to small median value of rainfall; the June rainfall varies in the area from nil to 888 millimetres , as in Pawayan. The maximum amount of rainfall increases generally from west to east in June. The very low situation of quartiles and medians in June at all stations explains that most of the years experienced very little rainfall in June. In September, the interquartile range is fairly long at most of the stations but the upper quartile and the median value at all stations are largely lower than in August, which shows a rapid transition with sharp discontinuity between August and September.

September has generally more variability of rainfall at all stations than June in which rainfall is more liable to be deficient at stations of first and second groups. (Figs. 24-27 and 28-30).

The median value and the lower quartile of August are respectively greater than the upper quartile and median value of September with the result that August is wetter than September at all stations except Gunnaur and Budaun where the month of August, which has lower median value than June, is still most probably wetter than September. The interquartile range in October is least of all months at all stations experiencing the least rainfall in most of the years. With the exception of Pawayan, the wettest station, all the stations have lowest median values without lower quartile in October, which denotes that at least five or six years had rainless October, and a large number of years got insignificant rainfall in this month. The location of median in October generally very close to zero

RAINFALL DISPERSION DIAGRAMS

JUNE – OCTOBER

(1928 – 1962)

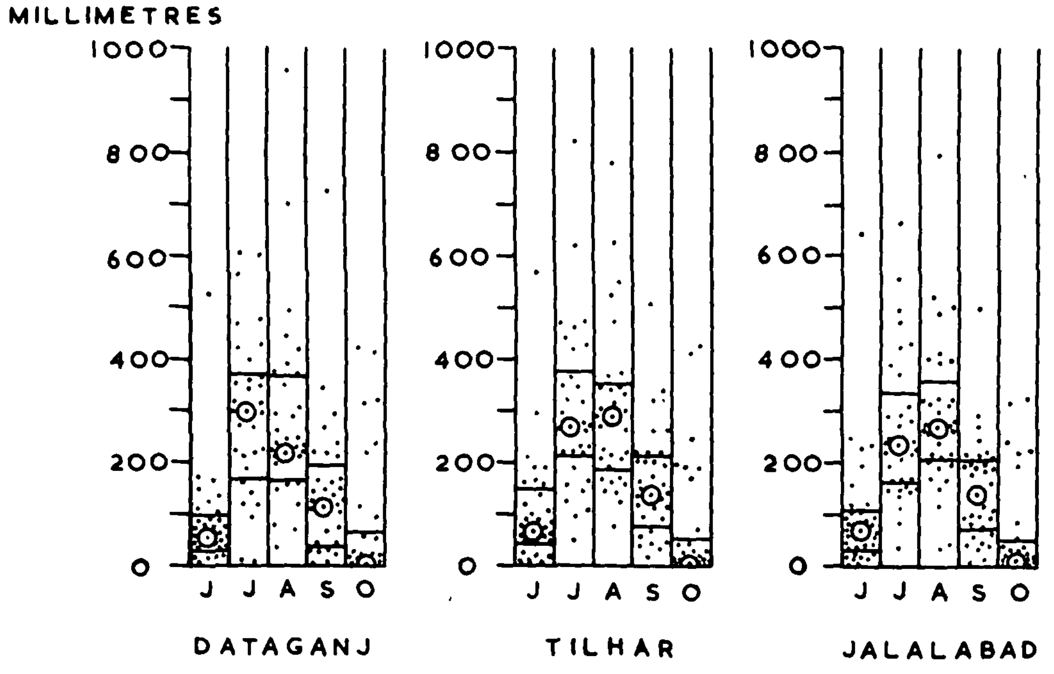


Fig.28 Fig.29 Fig.30

millimetre or even absent, as at Gunnaur, reveals (i) less probability of rainfall in most of the years and (ii) the greater probability of less rainfall. The October rainfall being as high as 600 or 700 millimetres casually at some stations provides the largest variability of rainfall in this month. The probability of rainfall in October varies from east to west, as the probability of maximum rainfall , experienced at Pawayan, is 700 millimetres which is not more than 250 millimetres at Gunnaur (Figs. 32 and 24).

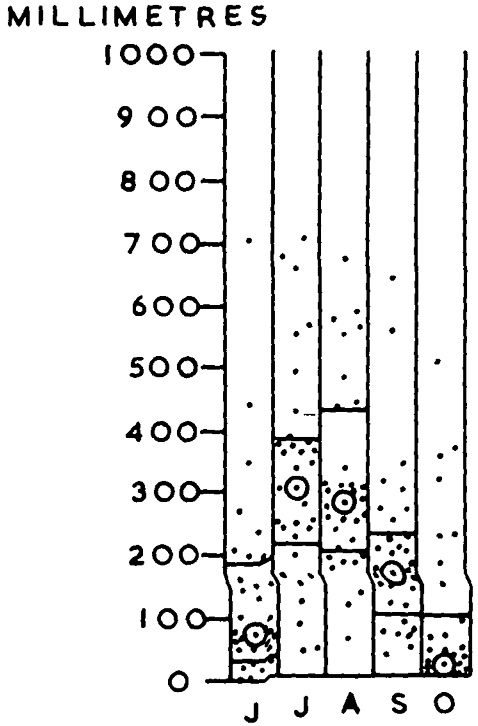
The stations of the first group (Figs. 24 to 27) being in the western part of the area under review have lesser median and upper quartile values than those of the second group (Figs. 28 to 30), in the respective months. The median values of any month at the stations of the first group do not go upto 250 millimetres while those of the second group are generally near 300 millimetres in July or August. The interquartile ranges, particularly in July and August , possess higher rainfall values and higher values of lower quartiles in the second group than those of the first group, which reveals lower variability-- and higher probability of greater rainfall in the second group than in the first group. The rapidity of the transition is with sharp discontinuity between August and September in the second group while it is gradual in the first group in the respective months.

Further, a comparison of the second and the third group of stations (Figs. 28—30 and 31—33) shows that the interquartile range of June in the third group is larger than those of the stations of second group. The upper quartile of June does not reach 150 millimetres in the second group

RAINFALL DISPERSION DIAGRAMS

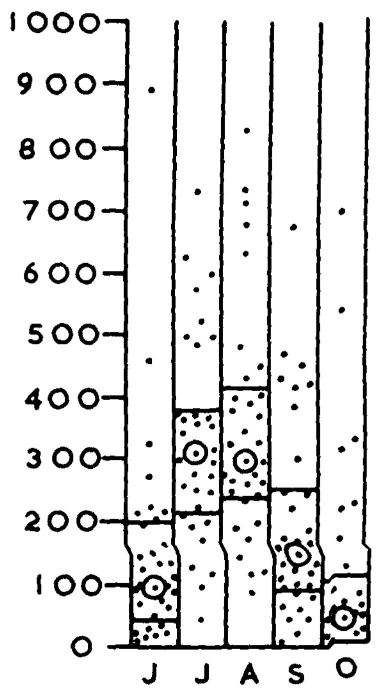
JUNE – OCTOBER

(1928 – 1962)



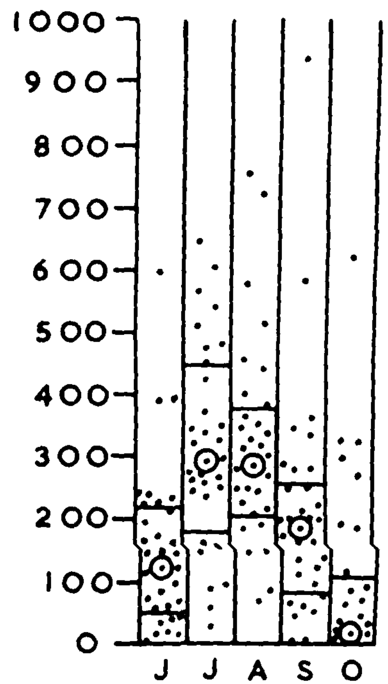
SHAHJAHANPUR

FIG. 31



PAWAYAN

FIG. 32



KHUTAR

FIG. 33

SOURCE : FIGURES 24-33 ARE BASED ON STATISTICS OF MONTHLY RAINFALL PUBLISHED BY THE GOVERNMENT OF UTTAR PRADESH FOR THE VARIOUS YEARS. (THE ENCIRCLED DOTS REPRESENT THE MEDIAN RAINFALL FOR THE VARIOUS MONTHS AT EACH STATION).

while it goes above 200 millimetres in the third group; similar is the case of median which is far below 100 millimetres in June in the second group while it is on 100 and above in the third group. The upper quartile of July and August in the second group is far below 400 millimetres while it is generally above this limit in the third group of stations which shows that the stations of the third group have still lower variability of rainfall and high probability of greater rainfall in most of the years than the stations of the second group; and it signifies that these months of the third group are the wettest months of the year in all the stations of the area.

The rapidity of transition between August and September is with sharp discontinuity in the second and third groups. But the lower quartile value of September in the third group is generally higher than in the second group. The median value of September is below 150 millimetres in the second group but it is upto 200 millimetres in the third group, which indicates greater probabilities of higher rainfall in September of the third group than that of the second group for most of the years. A comparison of the September median values of the stations reveals that the median value gradually increases station to station from west to east.

The month of October in the third group has larger quartile range and higher median value than those of the stations of first and second groups. The higher median values of each of the months at the stations of third group than those of the other two groups signify (i) greater probability of higher rainfall for most of the years and (ii) the least variability of rainfall in the wet monsoon season.

The variability of rainfall in June largely affects the agricultural operations as late occurrence of rainfall delays sowing of crops. The interquartile range showing variability of rainfall in July and August is less significant from agricultural point of view with regard to (i) much higher values of lower quartile and median and (ii) the highest amounts of total monthly rainfall in these months. The little rainfall in October is useful for the ripening of kharif crops, while its excessive occurrence is injurious.

Thus it will be seen that rainfall in western half of the area is quite variable in those months of the year when its regularity is most needed. Such a variability cannot but lead to uncertainties in agricultural operations.

CHAPTER III

SOILS

Adequate scientific material on the soils of the area are not available. The Settlement Reports of the Districts, District Gazetteers, Assessment Reports and the Revenue Records-- the oldest sources[1] of information available to the writer-- provide a textural classification of soils. The soil surveys of some scattered areas which have been carried out in recent times[2] provide only a generalized information and do not accurately show the soil sub-divisions of the area. The main factor governing the classification of soils for revenue assessment was the texture of the soil. However, soil fertility surveys were not initiated in the area in the past and data of soil analysis are not available for the area.

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1. *District Gazetteer*, Budaun, Vol.XV, (Allahabad, 1907); *District Gazetteer Shahjahanpur*, Vol.XVII, (Allahabad, 1910); *Report on the Revision of Records and Settlements Operations in the District Budaun*, (Allahabad,1886) *Report on the Revision of Records and Settlement Operations in the District of Shahjahanpur*, (Allahabad, 1886).*Final Settlement Report of District Shahjahanpur*, (Lucknow, 1943);Revenue Assessment Reports of Budaun and Shahjahanpur Districts, (un-published, 1928); the last reports consist of soil tract-wise volumes of the Tahsils.

2. I. *Soil Map of India*, prepared at Indian Agricultural Research Institute (New Delhi) in *Soil Management in India* by Arakeri, H.R.,Chalam, G.V. and Satyanarayana, P. (Bombay, 1962) , p. 2;
   II. *Survey of India School Atlas*, (Dehra Dun, 1964);
   III. *Soil Map of India*, Rama Rao, M.S.V., *Soil Conservation in India*, (New Delhi, 1962) ;p. 8; IV. *Soil Map*, by Raychoudhuri, *Bulletin of National Institute of Science of India*,(1954), No.3 , p.188 (B);V. *Soil Map National Atlas of India*, (1957), No.10; VI. *Soil Map of Uttar Pradesh*, by Raychoudhuri, S.P., Agrawal, R.R. etc. , *Soils of India* , (New Delhi, 1963), p. 318.

During the course of the field work the writer visited a number of villages in different parts of the area and obtained information on the soil fertility, texture and structure, its colour and workability, on the availability of water supply and manure, on the level of the land and on the capacity of soil to retain moisture.

On the basis of this and other existing information, a classification of soils of the area has been attempted and a soil map has been drawn. The soils of the area are alluvial and vary from sand, loam, silt and clay to occasional gravel beds and lenses of peaty matter. These soils vary in composition, texture and productivity; each of them possesses its own peculiarities with almost a homogeneous character in its tract.

According to the physiographical variations of fiver courses and the surface of the land, the area is divided into the Newer (Recent) alluvium called khadar and the Older (Pleistocene) alluvium called Bangar.

KHADAR [1]

The khadar lands along the rivers of Ganga, Ramganga, Garra and Gomati are low lying long strips of floodplain, where fine sand and silt is deposited whenever the rivers overflow their banks. The appearance and the soil fertility in the khadar lands vary. The prevailing form of soil is sand to silty sand, as the silt is often laid down upon sand. Fine silt is also found in flatter parts.

1. The accuracy of the lines demarcating each type of soil is limited in the absence of any detailed soil survey of the area. The map of the soils is based on informations available from the sources referred to above.

The *khadar* rivers spread sand, silt and mud, generally grey in colour, over vast *khadar* lands. But the clayey silt is the dominant texture of the soil in the Ramganga *khadar*. The sandy soil is utilized for the cultivation of millets, pulses sugarcane and rice (broadcast) in the *kharif*, and wheat, barley and peas in the *rabi* season. These crops in the *khadar* are unirrigated, even sugarcane is not irrigated, as the underground water-table generally remains very near the ground, about half to one metre below the surface. The *khadar* land is a good reservoir of under-ground water.[1] The Ganga-*khadar*, south of the Mahawa, 16 kilometres west of its confluence with the Ganga, has richer soil in fertility than that of the northern portions. In this portion the soil is annually silted and is locally called *bela* which is quite fertile. When a *khadar* soil is overdrained like that in the Ramganga *khadar*, it is called *patka* , but the land with the clayey subsoil, as in the northwestern and northeastern portions of the Ramganga *khadar*, is locally known as *khapat*. However, at places, the stretches of waste lands and *usar* with *dhak* and tamarisk trees are also found in the *khadar* lands of the area under review.

The sandy soil along the upper part of the Gomati, and especially on its left bank, is poor with waste lands and wild shrubs, and this is one of the worst parts of the Shahjahanpur district. But the very fertile silty and sandy soil of river Garra (Deoha) *khadar* provides good opportunities of cultivation, especially without irrigation in the vicinity of the river, and with irrigation at some distance.

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1. Krishnan, M.S., *Introduction to the Geology of India*, (Madras, 1944) pp. 169-70.

The Soils of Bangar Land: The Bangar soils vary from sandy bhur to clayey loam. They vary in colours also as well as in character. The bhur soil is generally of pale reddish brown colour while the sandy loam is of brown colour and the loams are grey or ash grey. The clayey loam soil has a dark grey colour. The gravel and conglomerates may be found in the older alluvium and not in any khadar soil. In the Budaun district, the kankar predominates in the bangar lands particularly at higher levels and these lands remain as waste land. The impervious layer of kankar may either be continuous or intermittent within the soil.[1] The kankar pebbles may be mixed with the cultivated soil also. If the kankar layer lies half a metre or more than under the cultivated soil, it does not much harm the growth of certain crops having shallow roots. It is noteworthy that the proportion of the land containing kankar is quite lesser in Shahjahanpur district than the Budaun district.

But most of the land containing kankar are of either sandy loam, bhur or clayey loam tracts. The size of the kankar varies from place to place[2]. However, it is not found everywhere. Most of the cultivated lands, in general, remain often free of kankar, as in the tract of loam soil.

Unlike the khadar soils, the soils of the bangar possess stable conditions with regard to texture, fineness and fertility; the fine soil- particles and the humus content can retain water for a longer time.

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1. Wadia, D.N., Krishnan, M.S. and Mukerjee, P.N.: Introductory Note on the Geological Foundations of the Soils of India, Agriculture and Live-Stock in India, Vol. VI, Pt. I, Imperial Council of Agricultural Research, (Delhi Jan., 1936), p. 78.
2. The size of the kankar nodules varies from a grain of pulse of lentil to as a man's head, or even more.

I. <u>The Sandy Soil (Bhur)</u>:[1] One of the <u>bangar</u> land soils, the <u>bhur</u> has an unusual geomorphic feature that adds a variety to the rather monotonous landscape. Its sandy ridges with a flat top and gentle lateral slopes extend into the Budaun district from northwest to southeast, being roughly parallel to the Ganga. But there is no <u>bhur</u> area in the Shahjahanpur district. The continuity of the <u>bhur</u> belt is broken by the Bhainsaur river. The sand deposits of <u>bhur</u> tract posses upland areas with an undulating surface feature. Yet the soil under cultivation has not the only sand, and it consists of a poor humus content in the texture. This is due to the fact that the soil has undergone several stages and degrees of oxidation.[2] It is likely that the Ganga has been flowing in the past upon the land now occupied by the <u>bhur</u> belt and the shift of the river from northeast to southwest might have been due to increased alluviation in the Recent. In the southwest of Budaun district, the Ganga—— that flows roughly parallel to the <u>bhur</u> belt ———, does more lateral corrasion on its right bank than the left, and makes more deposition on its left bank than on the right.

It is also likely that these are deposits of blown sand and fine dust, stretching upon vast tracts of land, mostly devoid of big trees and with occasional patches of dry grasslands. The <u>bhur</u> soil mostly suffers from inadequate supply of plant-food, as the soil is, for the most part, devoid

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1. The local names of the soils have been given in brackets. These names given by the farmers to their soils, are descriptive and tell with a reasonable degree of precision the agricultural properties of the soil—— ———Viswanath, B. and Ukil, A.C.——Comparative studies on Indian Soils, <u>Indian Journal of Agricultural Science</u>, Vol. XIV, Pt. V, (Delhi, Oct., 1944) p. 334.
2. Gerassimov, I.P.: Gangetic Types of Soils on the Territory of India, Journal of the Indian Society of Soil Science, Vol. VI, No.4, 1958, p. 195; and Singh, H.P. and Chatterjee, S.: The Soils of Rohana Kalan Zone of Muzaffarnagar District, U.P. <u>Indian Journal of Sugarcane Research and Development</u>, Vol. 2, Pt. IV, 1958), p. 191.

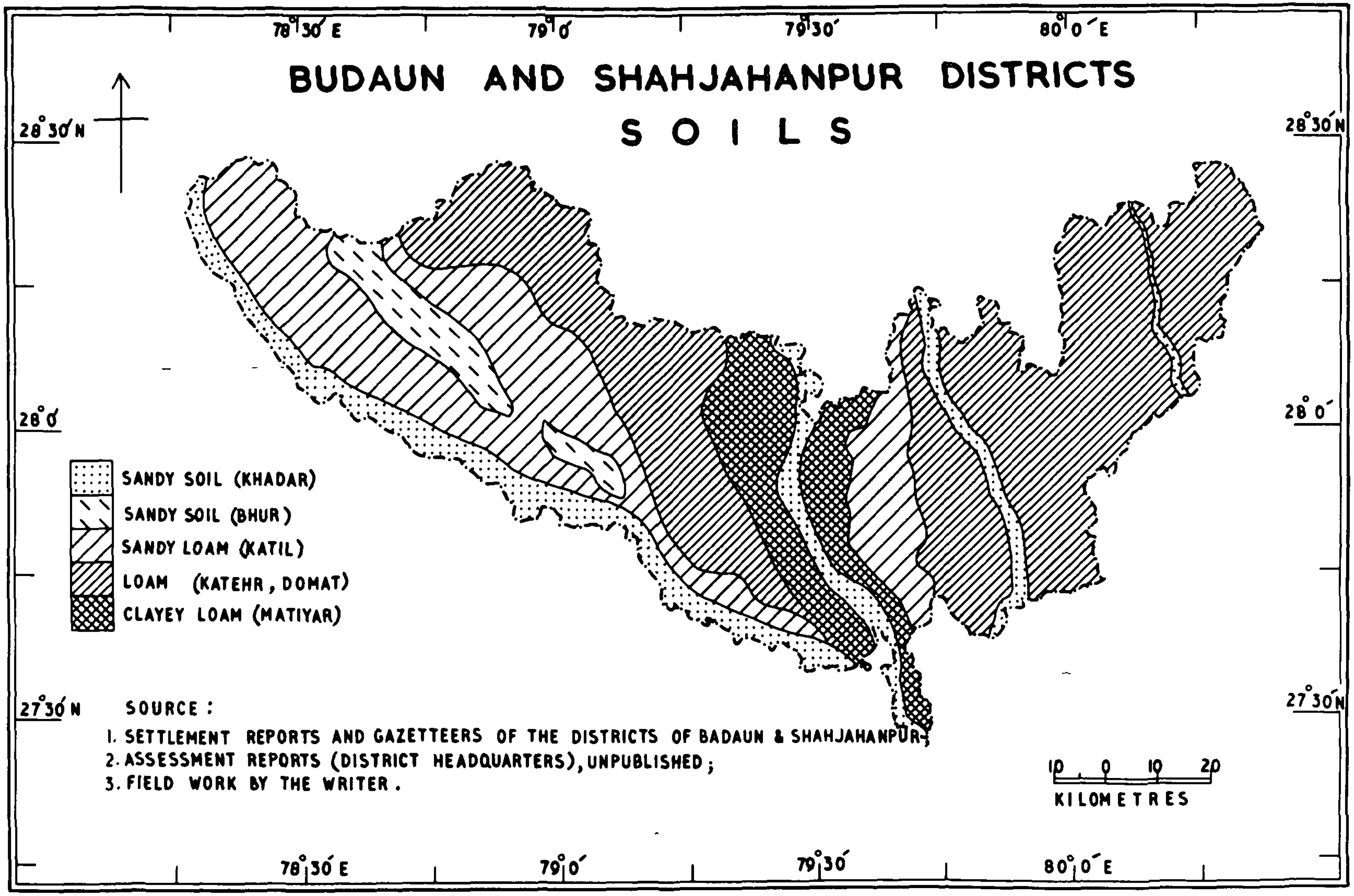
78°30' E
79°0'
79°30'
80°0' E
BUDAUN AND SHAHJAHANPUR DISTRICTS
S O I L S
28°30' N
28°0'
27°30' N
SANDY SOIL (KHADAR)
SANDY SOIL (BHUR)
SANDY LOAM (KATIL)
LOAM (KATEHR, DOMAT)
CLAYEY LOAM (MATIYAR)
SOURCE :
1. SETTLEMENT REPORTS AND GAZETTEERS OF THE DISTRICTS OF BADAUN & SHAHJAHANPUR;
2. ASSESSMENT REPORTS (DISTRICT HEADQUARTERS), UNPUBLISHED;
3. FIELD WORK BY THE WRITER.
10 0 10 20
KILOMETRES

FIG. 34

of organic matter. The deficiency of humus content in the soil is coupled with the deficient water supply, as it is commonly underdrained soil. It has little power of retaining moisture and is dry, loose and poor in productivity. It consists of about 90 per cent sand while clay particles are always less than 6 per cent.

The thatching grasses, known as sarkara , poola and sarwa, the noxious weeds known as kans, dry shrubs, called memri and only a few occasional trees are the only natural vegetation. It was until recently a somewhat negative tract[1] mostly, but now it has partly been reclaimed through some manuring and irrigation with masonry and non-masonry wells. This soil tract receives little rainfall during the months of rains.

The chief crops grown in this tract are millets and pulses, among the grain crops, and the groundnut among other crops of the kharif season,and wheat, barley and peas in the rabi season. The yields are generally very low.

There is a general practice of long-fallowing for one to three years to recuperate the fertility of the soil, and such a long fallowing is not generally practised in any other type of soil. No cultivation is possible without irrigation or manuring. The first class bhur soil with some moisture retaining capacity, known as thandi bhur , is better than the rest two kinds: the ' lokharia bhur'— consisting of high sandy ridges, and the ' urani bhur' comprising the sand brought by the blowing winds. The lokharia bhur on the western edge of the bhur belt overlooking the Ganga valley is the worst part of the tract.

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1. Spate O.H.K.: India and Pakistan, (London, 1957),p.500

II. Sandy Loam Soil(Katil): The areas occupied by the sandy loam soil lie generally in the western half of each of the districts under review, excepting the khadar belts. The katil belt in Budaun stretches much on both east and west sides of the bhur belt, as well as in the north and south of it. The katil soil, in comparison with the Ganga khadar soils has a smaller percentage of coarse and fine sand and contains a larger proportion of silt and soil-binding clay particles. It contains humus but lesser than loamy soil (katehr) . Without irrigation and manuring the soil becomes weak in crop production. It is remarkable that the tract under katil soil mostly has the least annual rainfall in the whole area under review. The underground water table of this soil tract is very low. Hence irrigation is a necessity for agricultural operations here. The calcareous concretion, kankar, is also seldom found. This soil is darker in colour than the khadar or bhur soils.

However, the soil needs seasonal manuring, particularly the farmyard manure, without which irrigation may not be sufficiently useful. The maintenance of soil fertility is best attained by dressings of farmyard manure which has the additional advantage of maintaining the life of micro-organisms such as those which convert organic remians into humus.[1] In a healthy soil it is essential to maintain a supply of organic matter so as to secure a balance between its oxidation which provides carbon dioxide and nitrates and its humification which provides humus and maintains the texture of the soil.[2] But the general practice of the farmers in this belt is to leave most of the cultivated land fallow for recuperating in fertility instead of applying organic manure.

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1. Stamp. L.D. The Land of Britain, Its Use and Misuse, (London,1962),p.292
2. ibid., p. 289

The use of masonry and non-masonry wells is mostly prevalent in irrigation. Tube wells are scanty. The main crops are millets, pulses, maize, tobacco and groundnut in kharif, and barley, peas and potato in rabi seasons; sugarcane is also grown where irrigation facilities are present. The sandy loam is ploughed more deeply than loamy or clayey loam soils.

III. Loamy Soil (Katehr): It is the best soil of the area. It contains approximately equal proportions of sand and clay. It is mostly rich in humus and organic matter. In fertility, no other soil can compete it. The colour of the surface soil is grey, with a brownish grey sub-soil. The drainage is good, but irrigation facilities are not adequate. The soil is easily workable and can retain water for a longer period as compared to sandy loam. The underground water table is low. The irrigation facilities are but necessary for agriculture.

The physical aspect of the soil has most important bearing on its fertility, as it provides the environment in which the vital biological activities can proceed in the soil by which nutrient substances are made available to the plant.[1] The practice of fallowing is less in this soil as compared to the sandy loam soil. The production of crops is best where manuring and irrigation facilities are available. The high proportion of organic matter is characteristic of this soil. The kankar is hardly found in this soil tract. The soil, being naturally the most productive, yields good crops of rice, millets and sugarcane in the

1. Basu, J.K. Soil Fertility, Indian Farming, Vol. III, No. 5, (Delhi, May,1942), p. 248.

kharif, and wheat, gram, barley, pulses , peas and potatoes in the _rabi_ season. The largest percentages of good (A) quality lands are in the _parganas_ of this soil tract. The groundnut, a cash crop, is also commercially produced where irrigation and manuring facilities are not adequate. Irrigation by wells is most prevalent as the temporary (non-masonry) wells can be easily dug.

IV. _The Clayey Loam Soil_ (_Matiyar_): It is found in both the east and west of the Ramganga in the heart of the area. The least proportion in its texture is of sand and highest is that of the clay particles which is nowhere less than 66 per cent. The _matiyar_ is darker in colour than any other soil. It is mostly grey, the sub-soil being dark grey. The higher parts, though rare, have stiff clay. The _kankar_ is also sometimes found in the subsoil. The chief physical defects of the clay soil are a too close and coherent texture and inadequate drainage. The activity of micro-organism, upon which the fertility of the soil is dependent, is hampered by either hard or sticky nature of the soil.

The _matiyar_ is better than the _bhur_ soil, it is a second grade soil as compared to the loamy soil (_domat_). The tract under _matiyar_ soil is flooded in the rainy season and much of the tract is waterlogged, and dampness prevails, but where the conditions are suitable, rice is the chief _kharif_ crop. In comparatively higher or drier parts, millets and _kharif_ pulses are grown; whereas gram, peas and fodder are the _rabi_ crops. The best land for rice crop is known as _dhankar_, in which both transplanted rice called _jarhain_ and broadcast rice called _bhadai_ are grown profitably.

The mativar soil is not continuous everywhere in its tract; the loamy or saline usar soils are also found in intervening parts, but to a lesser proportion. Poor drainage and marshy conditions lower the fertility, decrease organic content and increase salinity at places, as the watertable at some places is sufficiently high, at depths varying from half to two metres. Saline or waterlogged parts of mativar soil have toxic effects on plants and crops. The tract of the mativar soil is also known at some places as bankati, denoting that it was a forest area in the past. In the vicinity of Ramganga khadar, the soil is clayey loam, while it is calcareous clay far away. It is remarkable that most of clayey loam area is lowland, particularly in the west of Ramganga khadar.

Classification of Soils on the Basis of Fertility

Besides the above classification, the villagers also recognize an alternative system of classifying their lands in accordance with the (I) level of the land (II) location with regard to the village site, (III) presence or absence of salinity in the soil, (IV) and on the basis of varying degree of soil-fertility.

The fields adjacent to the rural dwellings are the best croplands where manuring and irrigation facilities are adequately available. The soil of the land near village dwellings known as gauhani, goind, bara and kachhiana, receives most of the village refuse and compost manure as well as a good deal of night-soil. The night-soil and the village manure are freely available to the fields adjacent to the village dwellings. The fields a little farther away are manured only occasionally while those situated at long distances from the village site hardly get any manure. The crops found in _gauhani_ soil are most remunerative and most productive; the inferior crops are found farther away. The _kachhiana_ is put to vegetable crops particularly. Rice, sugarcane, fodder crops and vegetables in _kharif_ and wheat, gram, barley, potato and vegetables in _rabi_ are well produced in _gauhani_ soil. The land with a marked slope is inferior in fertility to level land, and is mostly a single-cropped area. The lands with double-cropping and under sugarcane cultivation are the best fertile lands. The cultivated lands which are generally put to fallow for a season or more are the medium quality lands. Nearly all types of soils have this category of land also.

The poor quality lands which do not produce any crop are of two categories, i.e., the _banjar_ and the _usar_, or the cultivable waste and the uncultivable waste lands. The _banjar_ lands which have wild grasses, bushes and trees are generally put to grazing; thatching grass and fuel material are also obtained from it. But the _usar_ lands have different characteristics.

USAR SOIL

The presence of salinity in the soil is injurious to crops. The soil becomes infertile, and is termed as usar[1] soil. The distribution of this soil is extremely irregular. The soil is quite different in texture and chemical properties from the adjacent soils. The small pieces of usar lands are often found interspersed with fertile plots. The alkali salts are largely soluble in water. During the wet monsoon months these salts percolate and are deposited in the sub-soil while during the hot weather season the intensive heat exerting a capillary pull brings the water on the surface; the water evaporates leaving a crust of salts.

The toxicity of alkali soils might be directly due to the surface active sodium ions or the action might be indirect due to the physical condition set up in the soil.[2] The usar soil is called reh when it is more sandy and powder consists of much alkaline salt. It is called kallar when the soil consists ot high proportion of clay;but both are deleterious to the growth of vegetation. The kallar land, in addition to containing an excess of salts, is deficient in humus and possibly in bacteria useful to plant life. It is likely that present usar lands might have been agriculturally fertile in former days. Large areas, once fertile and populous, have become impregnated

1. The usar lands are also known as 'Usra'.
2. Joshi, N.V. and Puri, A.N. ' The Influence of Exchangeable Ions in Soil Colloids on Bacterial Activity and Plant Growth' Memoirs of the Department of Agriculture in India, (Calcutta, 1930), Bacterial Series, Vol.II, No.4, p. 79.

with these salts and much of the usar land has resulted within the last few decades; the reh is a mixture of sodium carbonate, sulphate and chloride with some calcium and magnesium salts, some of these salts are introduced by river and canal water.[1]

The heavy usar clays of the low land, subject to annual water-logging in the middle of the area, are quite different from the alkaline reh efflorescences of the dry area in and around the bhur tract. Some of these soils contain fair amounts of exchangeable sodium.[2]

Reclamation of Usar Soils: Some of the suitable methods of reclamation are: the improvement in drainage, the use of organic manures and green manuring, the production of the selected salt-tolerant crops, the use of chemical substances, and the use of irrigation where suitable, in addition to planned crop rotation.

The improvement of land drainage with proper flushing of the salts by excessive water is a useful method, as the washing out of salt from the land through drains for a number of years may reduce the salinity sufficiently.

The best way to reclaim kallar usar is to scrape it onto the irrigation butt, then to irrigate it and again plough it. After it, the dhup or dubra grass (Cynodon dactylon) found there is chopped up and is spread over the land. Afterwards a leveller and a plough furrow and a press are passed over the land. Manuring and irrigation in about six week time will render the soil cultivable.[3]

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1. Wadia , D.N. Krishnan, M.S. and Mukerji, P.N. Agriculture and Live-Stock in India, op.cit., p.80
2. Krishnan, M.S., Geology of India and Burma, op.cit.,p.541.
3. Col.Sir,Edward, ' Salt Lands Reclaimed by Dhup Grass', Indian Farming, (Delhi, June, 1940), Vol.I,No.6,p.280.

One of the best sources of reclaiming usar soils is to apply molasses, as the acids produced in the decomposition of molasses neutralise the alkalis.[1] The usar soils are generally poor in nitrogen and humus content. The organic matter in the form of compost and other manures and production of leguminous crops are very useful in its reclamation.

Whenever conditions are favourable, the frequent cropping of high salt-tolerant crops is noteworthy: barley, rape seed, cotton and sugarbeat, are the high salt-tolerant crops; while the crops of rice, millets, wheat, maize, pea, linseed and chari (a forage crop) include the medium salt-tolerant crops.[2]

h The leguminous crops like groundnut posses a great value in crop rotations, as they usually increase the yield of the successive crops; the increase of nitrogen and micro-biological activity in the soil is their useful result. Crops or plants of abundant foliage prevent the coming-out of the salts from below the surface of the land. The preference should be given to deep-rooted plants and crops which possess great shades; the shallow rooted seasonal crops of little shade like cereals should not be preferred, as after their harvest, the impeded salts rise up again.

The practical method of reclamation is : to divide the usar land into small fields, to erect small fields— embankments around all them to hold water, and then frequent ploughing. This process will cause sufficient leaching of the salts down to greater depths resulting in the improvement of soil structure.

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1. Dhar, N.R.—— ' Molasses, Nitrogen Fixation and Land Reclamation', Agriculture and Live Stock in India, Vol. VII, Pt. I, (Delhi, Jan., 1937) p. 105
2. Magistad, O.C. and Christiansen, J.E., ' Saline Soils— Their Nature and Management, U.S. Dept. of Agri. Cir. cited by Aziz Dullah Khan: Diagnosis and Reclamation of Usar Soils, Technical Bulletin No.4 (Lucknow, 1951), p. 13.
Diagnosis and Improvement of Saline and Alkali Soils, U.S. Salinity Laboratory Staff, Agricultural Handbook, No. 60, U.S. Dept. of Agriculture, 1954.

The bulky organic and green manures improve permeability and structure of the *usar* soil, producing various organic acids which neutralize some of the harmful salts.[1] After application of well-powdered gypsum to the soil, water is allowed to stand for the completion of its reaction. The green manure crops like *dhaincha*, *sanai* and indigo should be grown, and after about one and a half months, the green crop should be applied as manure to the land, ' thus the crop of paddy[2]' may be usefully grown. The other crops of the *kharif* and *rabi* seasons may also be produced; and the green manuring is thus the best for making such soils profitable.

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1. Khan, A.D. *Diagnosis and Reclamation of Usar Soils*, Bulletin No.4, (Lucknow, 1951), p.11.
2. Agarwal, R.P. *Progress of Recent Research in the Section of Agricultural Chemistry*, (Kanpur, 1953), p. 21.

CHAPTER IV

IRRIGATION

The districts of Budaun and Shahjahanpur have appreciable irrigation facilities although the ~~percentage~~ proportion of irrigated land to the total cultivated area shows considerable variations. Fig. 36 shows that in the east of the district of Budaun the percentage of the irrigated area to the total cultivated land goes down to 5, while in the same district in the northeastern part it goes upto 40. Fig. 36 further shows that with the exception of four parganas lying in the district of Budaun and five parganas in the extreme southeast, the entire area under study has less than 25 per cent irrigated area to the cultivated area.

A comparison of Figs. 35 and 36 would show that the high percentage of irrigated area in these parganas is either due to the large number of tube-wells or the presence of canals.

No irrigation map of the districts is available. At best the maps prepared by the State-Tube-Well and Canal Irrigation Departments show the location of tube-wells and canals in the different areas.[1]

The construction of wells in bangar land is a common feature, while in the khadar and tarai lands the subsoil remains almost saturated owing to nearness of the underground water and irrigation to the crops is not generally required.

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1. The location of masonry wells and private tube-wells, owing to their private management, is not shown on the irrigation map of the Irrigation Department and therefore they are not located in Fig.35. In addition to canal and tube-wells, there are other sources of irrigation, e.g., rahat, charas, dhekli, drawing water from masonry and non-masonry wells, ponds or streams. In assessing the proportion of irrigated area to the total cultivated area, all sources of irrigation have been considered.

Fig. 35 shows the distribution of State tube-wells and the system of canals in the area. The Irrigation Department has divided the districts into various irrigation groups for purposes of administrative conveniences. It will be seen from Fig.35 that there is a heavy concentration of tube-wells in the Bisauli group, in the eastern half of Islamnagar and Sahaswan groups and in the central parts of Budaun and Kakrala groups. There is a complete absence of tube-wells in the western parts of these groups owing to the presence of either _bhur_ soil or _khadar_ soils, the former being mostly barren and the latter having the relative nearness of the subsoil water. But in these groups, there are also loamy or sandy loam areas which are lacking in irrigation facilities, particularly by tube-well. With the exception of Pawayan _tahsil_ (east and west) and the Jalalabad _tahsil_, almost the whole of the district of Shahjahanpur is irrigated by canals.

Table III shows that with the exception of four parganas-- two in the northwest and two in the southeast-- where no facility for tube-well irrigation exists, the rest of the district of Shahjahanpur has all the sources of irrigation available in the area; but the northwest part of Shahjahanpur district-- Khera Bajhera, Tilhar and Nigohi--- has little irrigation by tube-wells. In the Budaun district tube-wells and masonry wells are the main sources of irrigation.

Fig. 36 shows the percentage of irrigated land to the total cultivated area in each pargana. It will be seen from Fig.36 that the whole of the districts of Budaun and Shahjahanpur, with the exception of four parganas-- two in the east of Budaun and two in the northwest and east of Shahjahanpur district--- have irrigated area above 15 per cent while the high percentage of irrigated lands shows a close correlation with the existing available facilities of irrigation from tube-wells or canals (Figs.35 and 36).

Lakes and ponds also constitute a significant source of irrigation in the districts. The lakes and ponds have been divided into two categories based on their size and capacity for irrigation: large lakes and ponds which can irrigate more than 100 acres and small lakes and ponds which irrigate less than 100 acres. The large lakes and ponds are found generally towards the right bank of the river Ramganga and indicate that the river flowed a little to the west in the past. The smaller lakes and ponds are, however, well utilized and irrigate sizeable area in the south-western, southeastern and northeastern parts of Budaun district, and the southwestern and eastern parts of Shahjahanpur district.

The other source of irrigation is the streams which have largest irrigation in the southeast of Budaun and southwest of Shahjahanpur districts--- Usehat and Jalalabad , in the latter this is the largest source of irrigation (Table III).

The total area irrigated and its percentage to the total cultivated land has been given in the Table III. The total area irrigated by all means in the two districts is 422, 525 acres which is 22.9 per cent of the total cultivated land.[1]

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1. The total cultivated land includes the net cropped land and the current fallow land in the year 1962-63.

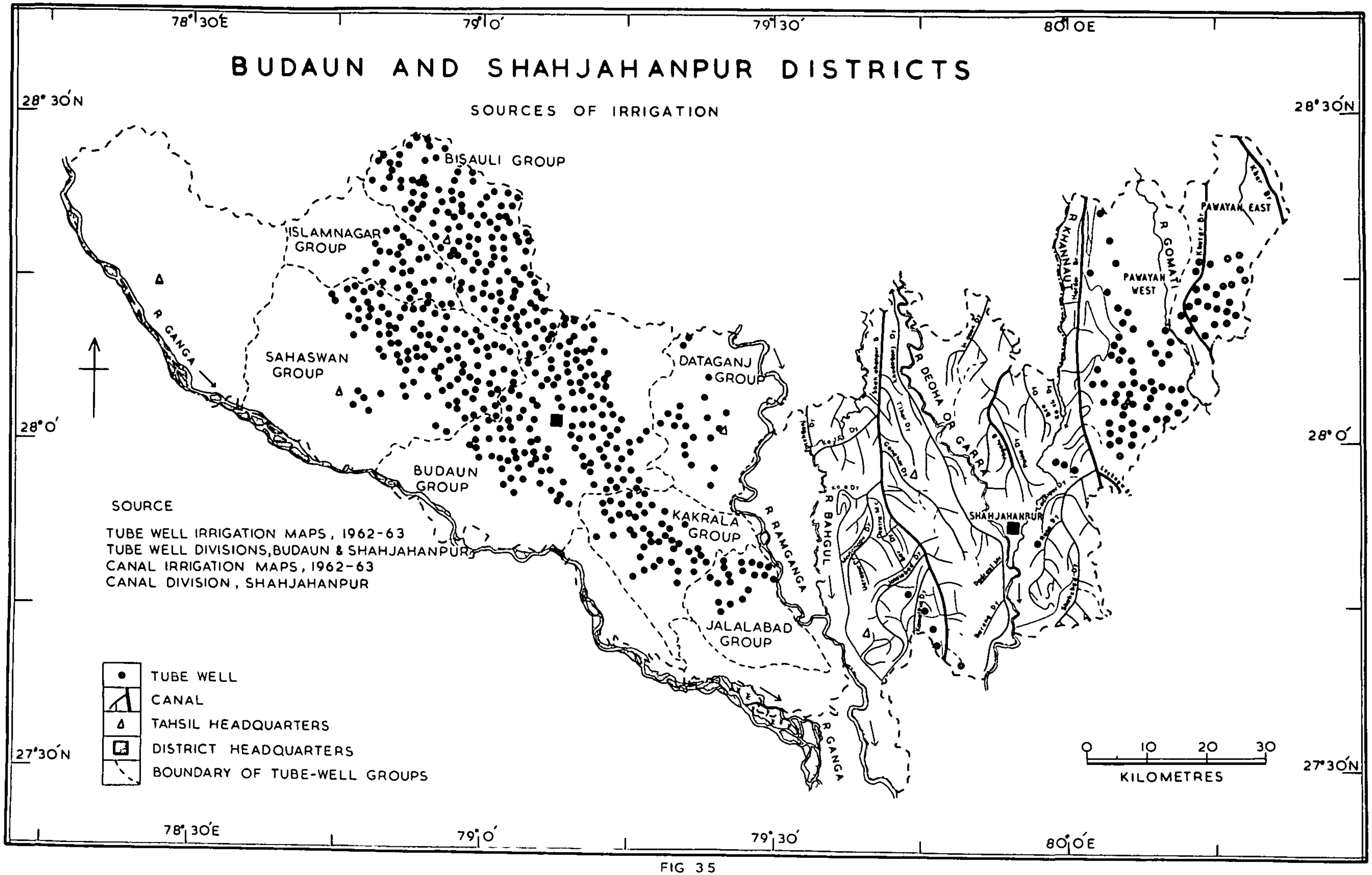
BUDAUN AND SHAHJAHANPUR DISTRICTS
SOURCES OF IRRIGATION
78°30'E
79°0'
79°30'
80°0'E
28°30'N
28°0'
27°30'N
BISAULI GROUP
ISLAMNAGAR GROUP
SAHASWAN GROUP
BUDAUN GROUP
DATAGANJ GROUP
KAKRALA GROUP
JALALABAD GROUP
PAWAYAN WEST
PAWAYAN EAST
SHAHJAHANPUR
R GANGA
R RAMGANGA
R BAHGUL
R DEOHA OR GARRA
R KHANNAUT
R GOMATI
SOURCE
TUBE WELL IRRIGATION MAPS, 1962-63
TUBE WELL DIVISIONS, BUDAUN & SHAHJAHANPUR
CANAL IRRIGATION MAPS, 1962-63
CANAL DIVISION, SHAHJAHANPUR
TUBE WELL
CANAL
TAHSIL HEADQUARTERS
DISTRICT HEADQUARTERS
BOUNDARY OF TUBE-WELL GROUPS
0 10 20 30
KILOMETRES

FIG 35

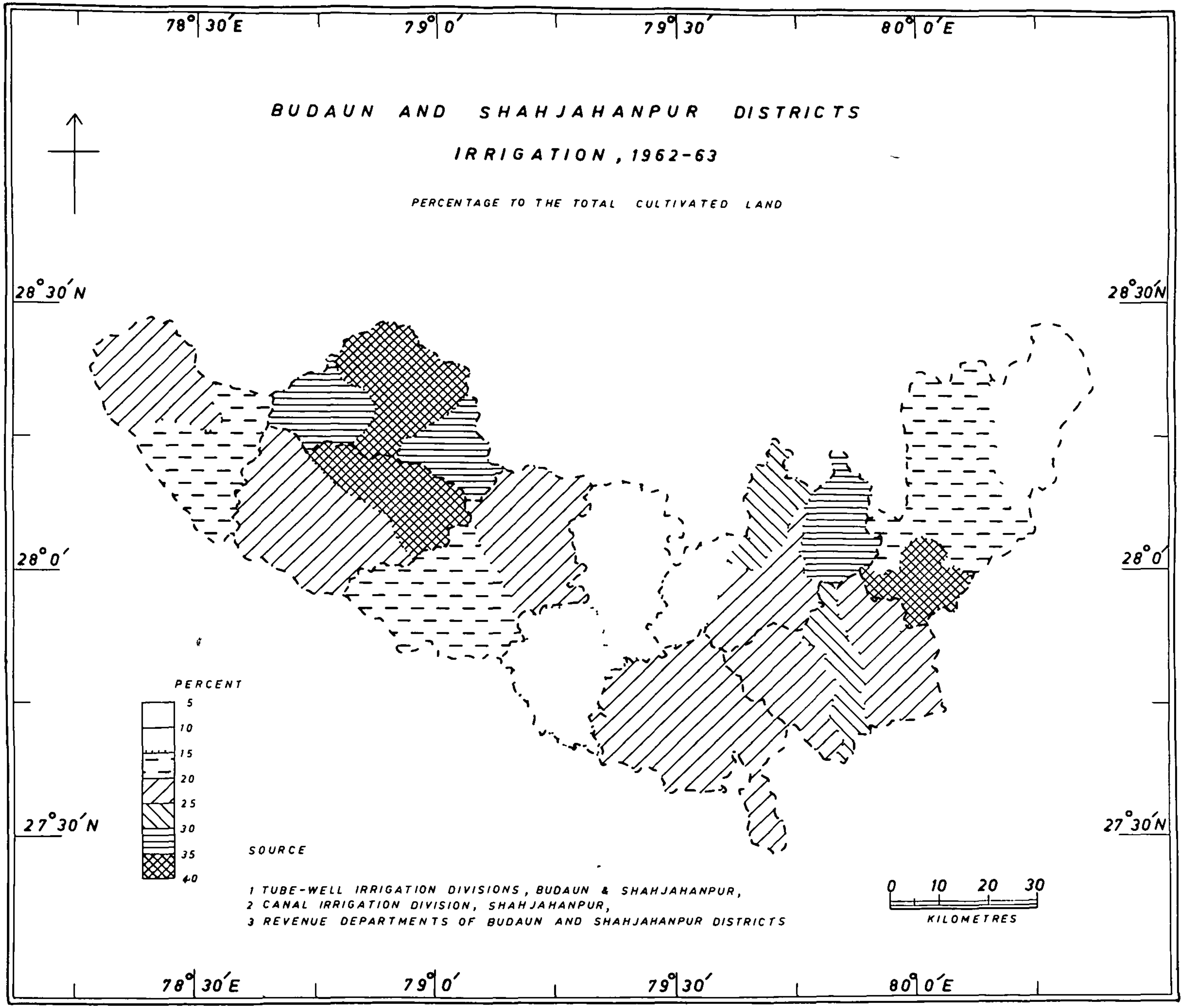
BUDAUN AND SHAHJAHANPUR DISTRICTS
IRRIGATION, 1962-63
PERCENTAGE TO THE TOTAL CULTIVATED LAND
78° 30′E
79° 0′
79° 30′
80° 0′E
28° 30′N
28° 0′
27° 30′N
PERCENT
5
10
15
20
25
30
35
40
SOURCE
1 TUBE-WELL IRRIGATION DIVISIONS, BUDAUN & SHAHJAHANPUR,
2 CANAL IRRIGATION DIVISION, SHAHJAHANPUR,
3 REVENUE DEPARTMENTS OF BUDAUN AND SHAHJAHANPUR DISTRICTS
0 10 20 30
KILOMETRES

FIG 36

Irrigation by State Tube-Wells

The area irrigated by State tube-wells have been divided into 10 groups for administrative convenience. The whole Gunnaur tahsil in Budaun and Tilhar tahsil in Shahjahanpur districts are, however, devoid of State tube-wells; besides it, pargana Jamaur also has no State tube-well.

It will be seen from table IV that Bisauli group[1] possesses the largest number of these tube-wells, being 131. It has the largest culturable as well as irrigated areas under their command. This area consists of good loamy soil. The Budaun group ranks second in importance, both in the number of tube-wells , irrigated area and the culturable commanded area, which consists of both loamy and sandy loam soils. The Sahaswan group, mostly sandy loam area, has the third largest number of these wells as well as the irrigated and the culturable commanded areas. The groups of Islamnagar, Kakrala, Dataganj, Jalalabad, Pawayan west and Pawayan east have considerable numbers of tube-wells and the culturable area under their command is fairly big. The depth of subsoil water in the bangar land of the whole area ranges from about 3 to 12 metres so that the construction of tube-wells is easy. The culturable area commanded by tube-wells varies from one group to another in accordance with varying rainfall during the year, the soil characteristics, the cropping pattern and the different crops with varying irrigation needs.

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1. A group of State tube-wells may be comprising more than one pargana , as in Bisauli or Sahaswan groups.

TABLE IV

Irrigation by State Tube-Wells, Budaun and Shahjahanpur Districts, 1962-63

Tube-well Groups	No. of Tube-wells	Total culturable commanded area (C.C.A.)	Total area irrigated by State Tube-wells (acres)		Irrigated area of only sugarcane (acres)		Seasonal average consumption of water per acre (litres)		Total assessment from tube-well irrigation
		acres	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Rupees
Bisauli (Bisauli and Satasi parganas)	131	117,309	7,297	27,245	6,137	4,305	892,384	709,485	521,056
Islamnagar	30	24,000	1,349	5,334	1,095	615	872,236	749,389	105,598
Sahaswan (Sahaswan and Kot parganas)	107	85,600	3,939	20,559	2,761	1,904	911,318	835,613	330,157
Budaun (Budaun and Ujhani parganas)	129	106,050	5,117	27,514	2,946	3,104	879,781	731,594	459,510
Dataganj (pargana Salempur)	20	4,649	476	2,287	186	114	624,708	563,218	26,680
Kakrala (pargana Ujhani)	43	30,600	1,811	8,778	1,596	1,273	889,394	758,237	146,517
Jalalabad	19	5,788	426	5,208	170	201	671,912	646,109	47,526
Shahjahanpur (parganas Kant and Shahjahanpur)	6	4,868	193	974	149	90	823,131	597,228	11,788
Pawayan West (parganas Pawayan and Baragaon)	60	52,222	6,107	6,343	5,556	995	1,244,949	830,827	197,880
Pawayan East (pargana Khutar)	25	20,420	1,345	1,463	1,287	187	1,238,229	771,176	40,530

S o u r c e: Unpublished Records of State Tube-wells Irrigation Department, Budaun and Shahjahanpur.

Table IV further shows that the sugarcane is the chief irrigated crop in the _kharif_ season in all groups of State tube-wells except Dataganj and Jalalabad groups where cultivation of sugarcane is small due to clayey texture of soil and mostly water-logged conditions in Dataganj, and in Jalalabad due to sandy texture of soil, high level of subsoil water and the waterlogging.

Besides the _rabi_ crops, sugarcane is also irrigated in _rabi_ considerably, particularly in Bisauli, Budaun, Sahaswan and Kakrala groups.

During the year 1962-63 the largest tube-well irrigation revenue was realised from the Bisauli group, followed by Budaun, Sahaswan, Pawayan west and Kakrala, and the ranking is in direct proportion to number of tube-wells. The larger the number of tube-wells, the greater is the amount of revenue realised.

Owing to volumetric sale of water in tube-well irrigation, the cultivator is financially interested in reducing the wastage of water between the well and the fields. A secondary thing is that when water for drinking, food preparing and bathing purposes is required by the peasants, it is healthy and free from germs of diseases.[1]

To meet the irrigation demands the flow of water in the subsoil must be adequate and should not be inactive during a possible draught period of acute irrigation demands.

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1. Vendenburg, E. Recent Artisan Experiments in India, _Memoirs of the Geological Survey of India_, Vol. XXXII, Pt.I, (Calcutta, 1904),p.19

The average discharge with a 15.24 Cm-strainer (or 6") is about 1,40,900 litres per hour by a State Tube-Well. The maximum area irrigable by a tube-well, however, depends on the time available between the waterings which again varies with the weather conditions, the nature of soils and the crops to be irrigated.

Under full rabi demand a tube-well, if operated for 22 hours a day, can irrigate about 330 acres of the cropped land during 45 days of irrigation in the rabi (15 November to 31 December or 1 December to 15 January) because a tube well irrigates an acre in 3 hours on an average. Gram, peas and barley need one watering during the early growing period, while wheat crop on loamy or sandy loam soil requires one watering in 40 days, usually from 15 November to 31 December in Budaun district and from 1st December to 15 January in Shahjahanpur district.

Sugarcane, an annual crop, requires irrigation from 15 March to 15 June and in October and occasionally in November. It is usually irrigated four or five times. A tube-well , therefore, can provide water to 145 acres of sugarcane on an average.

Table V shows that the cost of irrigation by a State tube-well is charged after assessment on metric values of supply of water, irrespective of crops, season and soil-types. Likewise irrigation by private tube-wells is generally provided on the basis of per hour supply.

TABLE V

Cost of Irrigation per acre by different means
(in rupees)

State Govt.[1] tube-wells	Private tube-wells	Masonry wells	non-masonry wells	Pond and streams
9.0 to 16.00	14.00	10.00	7.50	8.00

It will be seen from Table V that irrigation from ponds and streams is the cheaper and tube-well irrigation is costliest but in view of the seasonal nature of ponds and streams, irrigation from these sources cannot be relied upon. Further the quantity of water available from these sources is inadequate to meet the needs of sugarcane.

Although masonry wells constitute a better source of irrigation as compared to ponds and cheaper in relation to tube-wells, the access to tube-well irrigation saves the cultivator from the initial expenditure in digging the wells and as the cultivators are not well off, they would prefer a relatively expensive source of irrigation which does not involve any initial expenditure and assures a regulated and adequate supply of water on demand.

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1. The charges of irrigation by State tube-well are reduced to 33 per cent of the total if and when the following crops are irrigated: rice, maize, cotton, sannhemp, fodder, dhaincha , and moong (green gram pulse).

In the tract of sandy or sandy loam soil tube-well proves more profitable than masonry well as the former can irrigate much larger area than the latter. This is mainly because irrigation in sandy loam needs larger quantity of water which can be well provided by tube-wells. But where the tube well water is not available, the masonry well with *rahat* (Persian wheel) is largely used, for instance, in the southwestern half of Sahaswan *tahsil* , where there are few tube wells, the area is irrigated by masonry wells. It is interesting to note that out of a total irrigated area of 64,664 acres in Sahaswan *tahsil* (*parganas* Kot and Sahaswan), the tube-wells irrigate 24,498 acres-- about 38 per cent of the irrigated area, while out of total irrigated area, 32,454 acres in pargana Sahaswan the tube-wells irrigate 5,554 acres,--- about 17 per cent only. The main reason of the sharp decline of tube well irrigation in this pargana is due to the predominance of sandy soils.

The cost of irrigation by tube-well to the various crops (Table V) varies from rupees 9 to 16 per acre. This variation is in accordance with the varying volume of water needed by different crops. For example, an acre of sugarcane may require three or four times more water than that required by wheat, gram, barley or peas in an acre.

Canal Irrigation:

Canal irrigation is confined only in the district of Shahjahanpur. The area is not, however, exclusively irrigated by canals. Table III shows that the area irrigated by the Sarda Canal system in Shahjahanpur district varies from 25 per cent to 96 per cent of the total irrigated land.

Canal irrigation started in the area since 1928. Before the inception of canals in this area, ponds and wells constituted the main sources of irrigation. Canal irrigation has been gradually increasing in this area so much so that in 1962-63 the total irrigated area by canals rose to 122,304 acres--- 66 per cent of total irrigated area or 16 per cent of the total cultivated area. The percentage of canal irrigation is largest in the central parts of the Shahjahanpur district (parganas Tilhar, Jalalpur, Nigohi, Katra, Kant, Jamaur and Shahjahanpur). It constitutes 87 to 96 per cent of the total irrigated area. Canal irrigation is least in the southwest and in the eastern portions of Shahjahanpur district (parganas Jalalabad, Pawayn and Khutar) being 25 to 47 per cent of the total irrigated area.

The total culturable area commanded by canal system in the district is 439,228 acres, out of which 147,831 acres or 34 per cent of the culturable commanded area are at present irrigable by the canal system. But the actual area irrigated by canals in the *kharif* season is 73,634 acres or 40 per cent of the total area irrigated by all sources, and 48,702 acres or 26 per cent in the *rabi* season, totalling to 122, 304 acres or 66 per cent of the total irrigated area in the year of inquiry, Table VI.

The branches of the Sarda Canal system provide water to their distributaries which further feed the minor canals. Canal water is received upto outlet known as *kulaba*, from where it is distributed to fields through small channels known as *guls*. The *guls* which are privately constructed

TABLE VI

Area Irrigated by Canals, District Shahjahanpur, 1962-63
(in acres)

Gross area commanded by canals	Cultarable area commanded by canal irrigation works	Area irrigable at present by canal irrigation works	Area irrigated by canals, 1962-63			The crop year in which maximum area of the district was irrigated by canals	
			Kharif season	Rabi season	Total	Year	area
699,739	439,228	147,831	73,634	48,670	122,304	1942-43	125,248
Percentage of area irrigated by canals to the total irrigated area			40%	26%	66%		
Seasonal percentage of canal irrigation			60%	40%			

S o u r c e: Canal Irrigation Records (unpublished), Canal Irrigation Department, Shahjahanpur.

by farmers get silted sometimes and result in much wastage of water due to improper maintenance. The kulabas, which are generally under the charge of the Irrigation Department of the district, are not at times properly looked after and result in uneconomic use of water by the farmers.

Large variations occur in the supply of water in the river Sarda and in consequence the discharge of water into the branches, distributaries and minor canals also varies. There are variations also in the demand for irrigation from time to time during the kharif and rabi seasons. The discharge-run of water into irrigation channels varies widely from week to week, mostly in the rabi season; but the supply of water remains almost sufficient to rabi crops.

The total gross area commanded by canal irrigation system, as shown in the Table VI, is 699,739 acres in Shahjahanpur district. But the culturable area commanded by canals is 439,228 acres, a little over 60 per cent, out of which the area irrigable at present is 147,831 acres about one-third of the culturable commanded area.

The total area irrigated by canal-works, however, is much less than the irrigable area. The canal-irrigated area is 122,304 acres, a little over one quarter of the canal's culturable commanded area or about 83 per cent of the presently irrigable land.

It will be seen from Table VI that 60 per cent of the total irrigated land from canals in the Shahjahanpur district has been irrigated in the *kharif* season and 40 per cent in the *rabi* season, 1962-63. The increase of irrigated area in the *kharif* season is due to great demand for sugarcane and rice crops; this is further due to shortage of rainfall in June at Jalalabad, Pawayan, Khutar and Tilhar, in July at Shahjahanpur, Tilhar, Jalalabad and Pawayan, in August at Shahjahanpur and Khutar as given in the Table VII.

The comparisons of the areas under cultivation, irrigation, canal-irrigation, other types of irrigation, and crops in the years 1938-39, 1950-51 and 1962-63 have been given in the Table VIII.

The table shows a decrease of 9.4 per cent of canal irrigated area in 1950-51 as compared to the year 1938-39. But the area has increased to 34.2 per cent in 1962-63 as compared to 1950-51. Irrigation from wells has progressively increased since 1950-51 but there is a steady decrease in the irrigated area from ponds.

The Sarda Canal system in Shahjahanpur district has its five main branch canals, thirteen distributary canals and numerous minor canals. Their lengths in Shahjahanpur district, the bed-width and depth of water of each of them are given in the Table IX. The Shahjahanpur branch, alongwith its distributaries, possesses the largest area of the district in its command. This and the third largest branch, namely Nigohi branch, finish their work within the district, while Hardoi branch and Khutar and Kheri branches go to the Lakhimpur district.

TABLE VII

Shortage of Rainfall, Kharif & rabi months, 1962-63
(in millimetres)

	Stations	June		July		August		December		January		February	
		Average	Actual rainfall	Average	Actual rainfall	Average	Actual rainfall	Average	Actual rainfall	Average	Actual rainfall	Aver-age	Act-ual rain fall
1.	Dataganj	76.7	19.1	287.0	168.0			7.4	nil	19.3	12.7	19.8	nil
2.	Jalalabad	82.6	39.4	259.2	151.2			5.8	nil			17.4	nil
3.	Tilhar	94.7	nil	302.9	127.0			7.8	nil			21.2	10.2
4.	Shahjahanpur			306.1	261.2	294.3	167.7	6.9	1.7			19.9	2.3
5.	Pawayan	139.3	129.8	330.9	202.0			7.4	nil			22.5	nil
6.	Khutar	138.9	124.2			303.4	nil	6.5	nil			22.8	7.6

TABLE VIII

Comparison of Cultivated and Irrigated Areas and of Crops, district Shahjahanpur. (in acres)

	1938- 39	1950-- 51		1962-63	
	Area	Area	net increase or decrease of area to the year 1938-39 (per cent)	area	net increase or decrease of area to the year 1950-51 (per cent)
Total cultivated land	733,718	791,948	+ 7.9	960,504	+ 21.3
Total irrigated area	173,608	144,297	-17.2	184,622	+ 27.9
Area irrigated by canals	100,557	91,130	-9. 4	122,304	+ 34.2
Area irrigated by wells (of all types)	34,382	20,246	-41.2	37,642	+ 85.9
Area irrigated by ponds and other sources	38,669	32,921	-14.9	24,676	- 24.4
Double cropped area	98,282	97,768	- 0.5	128,996	+ 31.9
Area under rice crop	120,086	167,111	+ 28.1	200,690	+ 20.1
Area under wheat crop	258,986	216,182	- 16.6	126,406	- 41.5
Total area under millets, gram and barley	267,051	268,861	+ 0.7	365,572	+ 35.9
Area under sugarcane	52,449	65,572	+ 26.9	75,206	+ 14.7
Area under poppy	1,529	2,951	+ 93.0	negligible	—

source: (1) Season and Crop Reports, Department of Land Records, Uttar Pradesh Government, (2) Unpublished Records, Department of Land Records of Tahsils and the district.

TABLE IX

Branches and Distributaries of Sarda Canal System, Shahjahanpur District, 1962-63

Canals	Length (kms.)	Bedwidth (metres)	Depth of water (metres)	No. of days running: kharif	No. of days running: rabi	Average discharge, 1962-63 (cusecs per second): Kharif	Rabi	Annual average
Shahjahanpur Branch Canal:	67.6	13.71	1.52	182	116	469	653	561
Khudaganj distributary	63.565	5.49	1.28					
Tilhar distributary	16.291	1.83	0.82					
Katra distributary	14.427	2.74	0.97					
Gandhar distributary	24.744	2.74	0.30					
Madnapur distributary	22.932	4.57	1.09					
Jalalabad distributary	23.234	3.66	1.03					
Kamalpur distributary	11.275	3.35	1.00					
Nigohi Branch Canal:	16.827	10.36	1.52	129	102	294	264	279
Intgaon distributary	14.480	4.27	1.03					
Kareli distributary	9.117	2.74	0.86					
Beer distributary	17.096	2.74	0.88					
Paina distributary	17.498	3.05	0.70					
Hardoi Branch canal:	50.447	10.36	1.52	123	96	378	286	332
Shahabad distributary	32.190	4.27	1.09					
Rosa distributary	24.140	2.74	0.88					
Khutar Branch Canal:	32.5	10.36	1.52	108	87	246	229	238
Kheri Branch Canal:	16.3	10.36	1.52	102	81	253	217	235

S o u r c e: Irrigation records (unpublished), Canal Irrigation Department, Shahjahanpur.

The Shahjahanpur branch, longest in the area, works with its 7 distributary-canals and numerous minor canals and drains in between Bahgul and Ramganga rivers, on one side, and the Garra river on the other. The bed of the branch is 13.71 metres wide, 1.52 metres deep and the branch is 67.6 kilometres long. Among its distributaries, the Khudaganj distributary is the biggest in length, bed-width and depth of water. The Gandhar, Jalalabad and Madnapur distributaries rank next in importance. The branch and the distributaries distribute the water supply to their numerous minor canals, of which nine are chief. The Shahjahanpur branch has been working for maximum period in the year 1962-63 for 182 _kharif_ and 116 _rabi_ days.

The Nigohi branch canal, 16.827 kilometres long, 10.36 metres wide and 1.52 metres deep, has been working for 231 days of the year, mostly in _kharif_ season. Of its four distributaries, Paina is the largest, and Imtgaon is broadest and deepest. It has many minor canals and numerous drains to support the supply of water, in which six minors are the main. The canal system of the Nigohi branch is limited to the area between Garra and Khannaut rivers in the district and north of Shahjahanpur city.

The total area irrigated exclusively by the minor canals of the Shahjahanpur Branch is 2,779 acres in the _kharif_ and 3,590 acres in the _rabi_ season, 1962-63; whereas the minor canals of the Nigohi branch irrigated 3,951 acres and 3,127 acres in the _kharif_ and _rabi_ seasons respectively.

The irrigation work of the branch, distributaries, minors and the drains of the Hardoi branch canal is between the Khannaut and the Gomati rivers. The Hardoi branch, second longest in the area, is 50.447 kilometres long, with a bed-width of 10.36 metres and depth of 1.52 metres. It worked for 219 days in the year 1962-63, (123 days in the kharif season). Of its two main distributaries, Shahabad and Rosa, the former is the larger in length, breadth and depth of the bed, Table IX. The Shahabad distributary goes to Lakhimpur district, while the Rosa distributary which originates from the former distributary, irrigates the area within the district Shahjahanpur. The area irrigated by the Hardoi branch, distributaries and minor canals in the year 1962- 63 is 39,120 acres , or about 32 per cent of the total canal irrigated area.

The Khutar branch canal, 32.5 kilometres long, 10.36 metres wide and 1.52 metres deep, has been working for 195 days of the year, (108 days in the kharif season). It has no distributary or minor canals in the area. The canal is situated in the east of the Gomati river. It shares 1.7 per cent of the total canal irrigation in the district.

The kheri branch canal, 16.3 kilometres long, 10.36 metres wide and 1.52 metres deep, is the smallest branch canal in the area. It has one minor canal. These have been working for 102 days in the kharif season and 81 days in the rabi season. The canal is situated in the easternmost part of the area. The branch and the minor canals share the least proportion, 0.3 per cent, of the canal irrigation in the district. (Table X)

TABLE X

Lengthsand areas irrigated by the canals of the Sarda Canal System, District Shahjahanpur, 1962-63

Total lengths of canals (kilometres)				Total area irrigated (in acres)										Total area irrigated by all canals in the kharif and rabi seasons, 1962-63		Gross total of the area irrigated by all canals
Total length of all branch canals	Total length of all distri-butary canals	Total length of all minor canals	Total length of all branches, distribu-taries and minor canlls	irrigated by Shah-jahanpur branch, distri-butary and minor canals		irrigated by Nigohi branch, distribu-tary and minor canals		irrigated by Hardoi branch, distribu-tary and minor canals		irrigated by Khutar branch canal		irrigated by Kheri branch and minor canals				
				Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif season	Rabi season	
183.674	290.989	178.260	652.923	35,762	22,983	13,664	8,371	22,926	16,194	1095	961	187	161	73,634	48,670	122,304
Total				58,745		22,035		39,120		2056		348				
Percentage of the area irrigated by the canals to the total canal irrigated area.				48		18		32		1.7		0.3		60	40	

The average discharge of water and the flow is different in the five branch canals. The discharge[1] of water in the Shahjahanpur branch is, on an average, 469 cusecs in the *kharif* and 653 cusecs in the *rabi* season, being the largest in all canal irrigation system in the district Shahjahanpur. The discharge of water in the Nigohi branch has an average of 294 cusecs in the *kharif* and 264 cusecs in the *rabi* season. The average discharge of water in Hardoi branch is 378 cusecs in *kharif* and 286 cusecs in the *rabi* season, Table IX. The average discharge of water in the khutar branch is 246 cusecs in the kharif season and 229 cusecs in the *rabi* season; while the average discharge in the kheri branch is 253 and 217 cusecs in the *kharif* and *rabi* seasons respectively.

The direction of the flow of the five branch canals is generally north to south with a very slight moving; the distributaries have a little greater curvature or moving; while the directions of minors have much larger and different bending than other canals.

The total length of all canals-branches, distributaries and minors — in the area under review, is 652.923 kilometres, as is given in the Table X. The five branch canals have a total length of 183.674 kilometres; the thirteen distributary canals have a total length of 290.989 kilometres, while thirty seven minor canals of the canal-system have a total length of 178.260 kilometres in the area. The bigger number of minor canals with

1. The discharge of water, measured at the Canal Headworks, is still recorded in the cusecs (cubic feet per second).

a total length of 178.260 kilometres denotes their average length, being very small. There are numerous drains to help canal irrigation system.

The table further shows that the Shahjahanpur branch system of canals irrigates the largest share, 48 per cent of the total canal-irrigated area in the district. The Shahjahanpur branch system of canals irrigates 35,762 acres. in Kharif season and 22, 985 acres in the rabi season; the Nigohi branch system irrigates 13,664 acres in Kharif and 8,371 acres in rabi , being totally 18 per cent of the total canal irrigated area; while Hardoi branch system irrigates 22, 926 acres in Kharif and 16,194 acres in the rabi season, being totally about 32 per cent of the total canal irrigated area. The Khutar branch irrigates 1,095 and 961 acres in the kharif and rabi seasons respectively, which is only 1.7 per cent of the total canal-irrigated area of the district. The total area irrigated in the kharif season by the entire canal system in the district is 73,634 acres or 60 per cent of total canal irrigation, nearly half of which is shared by the Shahjahanpur branch system. In the rabi season the total canal-irrigated area is 48,670 acres, being 40 per cent of canal irrigation in the district.

The total area irrigated by canal system in the year 1962-63 is 122,304 acres in the district which is 66 per cent of the total land irrigated by all means (Table III), 13 per cent of the total cultivated land, and 11 per cent of the total area of the district.

There are two means of canal irrigation: flow and lift.[1] Wherever the field to be irrigated can well be irrigated by the flow of water running in a canal or drain through breaking the sided embankment of the canal or drain, the water of the canal is then allowed to come into the field freely, it is called the flow method of canal irrigation. In this method, the surface of the canal water must be higher than the level of the land to be irrigated to ensure the flow. In the other method, that is the lift method, the cultivator has some difficulties of employing labour for irrigation.

Wherever the surface of the land to be irrigated is higher than the water surface of the canal, the cultivator lifts the water through the bokey as it is called locally.[2] The cultivator has to bear labour-charges for it. It is why the Irrigation Department has granted concessions by 50 per cent of what the charges are levied in the flow method. The water is also lifted with the leather-bucket , but only occasionally.

The flow method is most prevalent in the area and a low percentage of canal irrigation is by lift method. The Table III reveals that the largest percentage of canal irrigated land is irrigated by flow method in each of the parganas of Shahjahanpur district. The total canal irrigated area by flow methods is 109,928 acres being about 90 per cent and by the lift method 12,376 acres or about 10 per cent of the canal irrigation in the whole of the district.

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1. Locally known as ' tor' and 'dal' respectively; the dal or lift method involves labour charges and, therefore, its rates of irrigation are half of the tor or flow method for all crops, Table XI.
2. A bokey is a rectengular basket made of bamboo plies,it is used with the help of four ropes tied on its corners: the water is lifted by two or four adults.The labourers are employed generally for a large irrigation.

The Rates:

The various crops are assessed at different rates of irrigation. The prevailing water rates are determined in accordance with water requirement of the crop and the method that has been applied for irrigation from canal. The Table XI shows the water rates in the following.

TABLE XI

CANAL IRRIGATION RATES, 1962-63

Crops	Rate of irrigation per acre			
	By flow method		By 'lift' method	
	Rupees	Paise	Rupees	Paise
Kharif Crops:				
Sugarcane	32	00	16	00
Tobacco	16	00	8	00
Rice, vegetables, groves, orchards, water caltrop, melons, water-melons	14	00	7	00
Big millet (*Jowar*), bulrush millet (*bajra*) and maize	7	00	3	50
Cotton (palewa)[1]	4	50	2	50
Fodder	3	00	1	50
Sannhemp (for green manuring)	2	00	1	00
Rabi Crops				
Vegetables	14	00	7	00
Wheat, wheatgram, wheat-gram-peas	12	00	6	00
Peas, lentil, oilseeds	9	00	4	50
Palewa	3	75	1	88
Fodder	3	00	1	50

1. The application of the pre-sowing irrigation is locally termed as *Palewa*

The crop of sugarcane has largest requirement of water, hence it is assessed at the rate of rupees 32 and rupees 16 per acre by flow and the lift methods respectively; while wheat, alone or mixed with gram or peas or both, is assessed at the rate of rupees 12 and 6 per acre, because of the lesser water requirement of these crops. In case the crops are adversely affected by climatic vagaries like hailstorms, floods or droughts, the whole or part of the irrigation dues is remitted.

The canal irrigation rates for rice and vegetables are rupees 14 and 7 by flow and lift methods respectively. The crops of millets and maize require lesser water than the above crops and the irrigation rates of them are just half to that of rice-irrigation. For crops of peas, lentil and oilseeds the respective rates are rupees 9 and 4.50 per acre. The smallest rates are of fodder and sannhemp crop for green manuring.

Irrigation by Masonry and Non-masonry Wells, Streams Lakes & Ponds

The areas bordered by the river Ramganga, and nearly the whole of Shahjahanpur district possess the largest number of non-masonry wells, while the district of Budaun has the largest number of masonry wells.

It will be seen from Table XII that there are about 159 masonry wells which lie within the canal irrigation zone mostly in the western half of Shahjahanpur district while the non-masonry wells within the canal irrigation zone are numerous in the southern half of Shahjahanpur district. In the whole

TABLE XII

MASONRY AND NON -MASONRY WELLS, PONDS, AND LAKES, BUDAUN AND SHAHJAHANPUR DISTRICTS
1962-63

PARGANAS	Number of wells used in 1962-63: within canal irrigation zone, Private, masonry	within canal irrigation zone, Private, non-masonry	out of canal irrigation zone, State Govt, masonry wells	out of canal irrigation zone, Private, masonry wells	out of canal irrigation zone, Private, non-masonry wells	Total, masonry wells	Total, non-masonry wells	GRAND TOTAL mas.	GRAND TOTAL non mas	Number of masonry wells built in 1962-63: Govt.	Number of masonry wells built in 1962-63: Private	Number of wells unused in 1962-63: masonry Govt.	masonry Pvt.	non-masonry Private	Number of ponds and lakes: with a capacity to irrigate above 100 acres each	with a capacity to irrigate less than 100 acres each
DISTRICT BUDAUN																
Rajpura	—	—	—	1833	534	1833	534	1833	534	—	182	—	173	3	—	1
Asadpur	—	—	1	2309	444	2310	444	2310	444	—	119	—	425	3	—	54
Sahaswan	—	—	19	2626	1226	2645	1226	2645	1226	3	250	3	352	11	1	203
Kot	—	—	85	1769	127	1854	127	1854	127	4	134	-	340	7	2	185
Islamnagar	—	—	74	2032	61	2106	61	2106	61	—	188	4	448	6	—	355
Bisauli	—	—	68	899	143	967	143	967	143	—	14	1	404	76	—	260
Satasi	—	—	47	175	84	222	84	222	84	—	25	-	173	6	—	262
Budaun	—	—	82	712	652	794	652	794	652	3	83	-	339	1	9	193
Ujhani	—	—	52	1039	1044	1091	1044	1091	1044	4	92	-	193	12	12	204
Salempur	—	—	10	439	977	449	977	449	977	—	41	-	21	2	9	102
Usehat	—	—	40	335	582	375	582	375	582	—	7	-	21	-	2	78
District Total	—	—	478	14168	5874	14646	5874	14646	5874	14	1135	8	2889	127	35	1897
DISTRICT SHAHJAHANPUR																
Khera Bajhera	6	—	—	26	1444	26	1444	32	1444	-	—	—	6	—	—	14
Tilhar	48	27	—	106	447	106	447	154	474	-	—	—	8	—	—	115
Jalalpur	—	7	—	14	130	14	130	14	137	-	—	—	2	—	—	28
Nigohi	2	3	—	19	329	19	329	21	332	-	5	—	12	23	4	171
Katra	—	—	—	39	6	39	6	39	6	-	—	—	2	—	—	—
Jalalabad	22	208	5	724	5431	729	5431	751	5639	-	36	—	26	3	—	667
Kant	2	196	—	2	231	2	231	4	427	1	3	7	3	3	5	208
Jamaur	52	162	—	14	108	14	108	66	270	—	10	135	1	4	1	305
Shahjahanpur	15	38	—	189	401	189	401	204	439	-	—	3	11	2	12	568
Baragaon	4	24	—	26	168	26	168	30	192	-	—	-	29	—	—	752
Pawayan	7	1	—	55	2049	55	2049	62	2050	-	41	—	466	—	2	2010
Khutar	1	—	—	16	155	16	155	17	155	-	—	—	17	—	5	903
District Total:	159	666	5	1230	10899	1235	10899	1394	11565	1	95	145	583	35	29	5741
Grand Total of the whole area	159	666	483	15398	16773	15881	16773	16040	17439	15	1230	153	3472	162	64	7638

S o u r c e : Unpublished Records of Revenue Department, districts Budaun and Shahjahanpur.

of Shahjahanpur district, there are 11,565 non-masonry wells in number out of which 666 are within the canal irrigation zone. The masonry wells are predominant in the western part of the area. Comparatively they are very smaller in number in Shahjahanpur district (1,394) than in Budaun district (14,646).

A masonry well involves the construction of long feeding channels in order to bring the water to the fields and this leads to some loss of water from absorption and evaporation; while a non-masonry well being much less expensive in construction can be dug quickly in close proximity to the crop and can supply water. During the year 1962-63, the eastern part of Budaun district and the whole of Shahjahanpur district possessed larger number of non-masonry wells (13,124) than the masonry wells(2,218). It is due to sudden need of irrigation in the kharif and mostly in the rabi season when the rainfall in the kharif was below the seasonal average (Table VII) and it was quite scanty in the rabi season.

The new wells constructed during the year of investigation have mostly been built in Budaun district. The masonry wells built by the State Government are 15, of which 14 are in Budaun district. Out of 1230 masonry wells built privately in the area, 1135 are in Budaun district due to more want of irrigation facilities. They are largest in the southwest and west of Budaun district (Sahaswan, Rajpura and Islamnagar parganas). The tract of least rainfall and mostly sandy/or sandy loam soil-- the western half of Budaun district-- (Rajpura, Asadpur, Sahaswan, Kot and Islamnagar parganas)--- has been paid due attention with the result of largest number of newly constructed masonry wells.

The irrigation by <u>rahat</u> or Persian wheels on a masonry well or by <u>charas</u> or <u>dhekli</u> means of a well— masonry or non-masonry—— is generally done on the daily wage basis; most of the cultivators do the work themselves, particularly when they irrigate from a non-masonry well.

There is a number of masonry and non-masonry wells which were not used during the year of investigation. These were 153 of the State property and 3,472 were private masonry wells, out of which 2,889 were in the Budaun district. The biggest number of total wells unused was 481 at Bisauli where the rainfall in the <u>kharif</u> season, 1962-63 , was more than average.

There are 64 ponds and lakes in the area which are capable to irrigate above 100 acres each. The rivers like Ramganga, Bahgul, and Garra do a great deal to fill up large lakes and ponds in the wet monsoon months.

The ponds which can irrigate below 100 acres of land are large in number and are almost everywhere in the area. More than three fourth of all are in the district of Shahjahanpur. The western and the eastern parts of Budaun district have lesser number of such ponds than the middle part. The area irrigated by such ponds is larger in Budaun district (19,712 acres) than in the Shajahanpur district (9,315 acres). In Shahjahanpur district they are mostly in the southern and eastern parts (Jalalabad, Kant, Jamaur, Shahjahanpur, Baragaon, Pawayan and Khutar), being 5,413 out of the district total 5,741. Greater utilization of this source of irrigation in Budaun than Shahjahanpur district is due to lesser average rainfall in the former district resulting in continuous need of irrigation.

The irrigation from a pond or stream is done through the bokey or lift system and the water is generally lifted to a height of 1 to 1.5 metres with two or three sets of labourers and bokeys at different levels forming a terrace-like surface of the adjoining land.

CHAPTER V

Agricultural Land Use

Agriculture is the mainstay of most of the people in the area. The economy of the area is basically dependent on rural life. The cultivated area varies from 68.8 to 92.7 per cent of the total area. Fig.37 shows that a substantial area remains unirrigated. Table XIII shows that the land under cultivation in the districts of Budaun and Shahjahanpur respectively is 83 per cent and 81 per cent of the total area, whereas the irrigated area in the respective districts varies from 7 to 40 per cent and 8 to 36 per cent of the total area under cultivation (Table III).

Table XIII shows the percentage of each use of land to the total area pargana-wise. Rajpura and Khutar parganas which cover the western and eastern parts of the area have lesser proportion, 69-70 per cent, of cultivated land as compared to the rest of the area. This is due to the fact that forests and meadows occupy very large areas here, 19 and 23 per cent of the total area as compared to other portions of the area. The northwestern part of Budaun district (parganas Kot, Islamnagar, Bisauli and Satasi) possesses more than 91 per cent of the total area under cultivation. The areas northeast and north of the river Ganga, west of the Ramganga and situated west of the Garra river have upto about 85 per cent of the total area under cultivation. At times some of fertile lands in the khadar is eroded or transformed into barren sandy land. A strong current of receding water is quite disastrous and causes great damage to the standing crops. Thus large tracts of land near the river courses of the Ganga

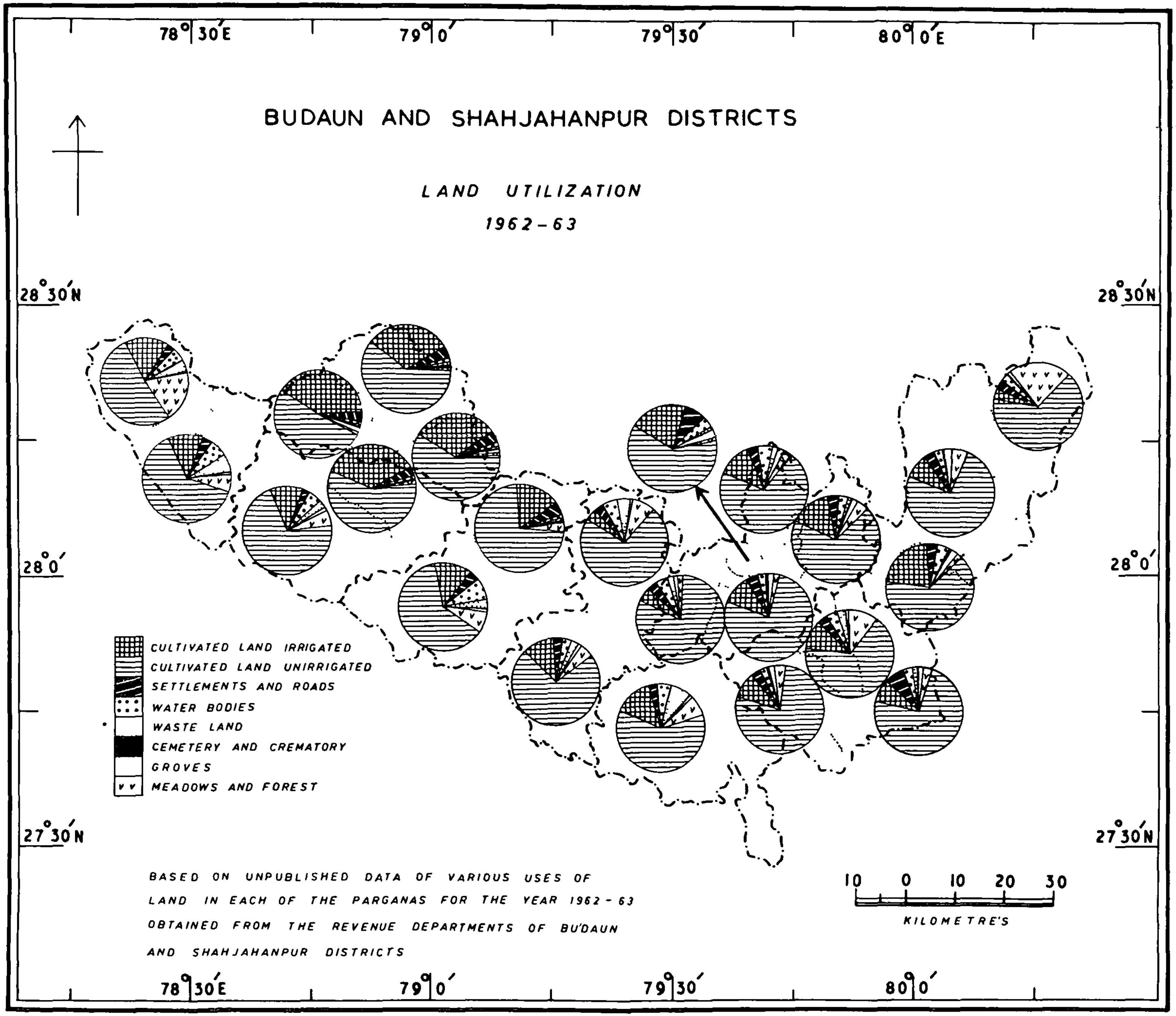
BUDAUN AND SHAHJAHANPUR DISTRICTS
LAND UTILIZATION
1962-63
78°30'E
79°0'
79°30'
80°0'E
28°30'N
28°0'
27°30'N
CULTIVATED LAND IRRIGATED
CULTIVATED LAND UNIRRIGATED
SETTLEMENTS AND ROADS
WATER BODIES
WASTE LAND
CEMETERY AND CREMATORY
GROVES
MEADOWS AND FOREST
10 0 10 20 30
KILOMETRE'S
BASED ON UNPUBLISHED DATA OF VARIOUS USES OF LAND IN EACH OF THE PARGANAS FOR THE YEAR 1962-63 OBTAINED FROM THE REVENUE DEPARTMENTS OF BU'DAUN AND SHAHJAHANPUR DISTRICTS

FIG.37

TABLE XIII

LAND UTILIZATION, BUDAUN & SHAHJAHANPUR DISTRICTS, 1962-63

Percentages to the total area of the parganas

Agricultural & Other Uses of Land

Parganas	Total area of the Pargana (acres)	Cultivated land %	Land under settle-ments & roads	Land under groves	Land under water bodies	Jungle and meadows	cemetery and cre-matory	waste land
		%	%	%	%	%	%	%
DISTRICT BUDAUN								
Rajpura	104,113	68.8	2.8	0.4	4.9	18.5	--	4.6
Asadpur	127,025	77.0	2.9	0.7	6.4	6.4	0.1	6.5
Sahaswan	180,019	83.3	2.6	1.2	4.8	5.4	--	2.7
Kot	90,492	92.7	3.3	1.6	1.1	0.9	--	0.4
Islamnagar	86,519	91.7	3.7	1.6	1.2	1.1	0.1	0.6
Bisauli	87,720	91.0	4.3	1.1	1.5	0.9	0.1	1.1
Satasi	56,073	91.1	4.1	1.1	1.8	0.9	0.2	0.8
Budaun	134,510	89.5	4.7	0.6	1.2	2.9	0.3	0.8
Ujhani	156,127	78.6	3.7	0.6	5.8	7.7	0.1	3.5
Salempur	146,811	77.5	3.4	0.9	5.3	8.1	--	4.8
Usehat	123,171	84.8	3.4	1.2	3.1	4.9	--	2.6
DISTRICT SHAH-JAHANPUR								
Khera Bajhera	58,296	86.9	3.4	1.2	4.4	1.8	--	2.3
Tilhar	79,761	87.7	4.4	2.4	3.0	1.9	0.1	0.5
Jalalpur	47,311	83.9	3.9	2.1	5.4	2.7	--	2.0
Nigohi	71,283	85.3	3.9	2.1	3.3	4.1	0.1	1.2
Katra	8,279	83.1	7.8	2.6	3.9	1.3	--	1.3
Jalalabad	234,848	75.8	3.0	1.0	5.2	7.2	0.1	7.7
Kant	90,399	87.6	3.6	2.0	2.4	3.9	0.2	0.3
Jamaur	64,572	77.8	3.5	1.0	4.0	10.7	--	3.0
Shahjahanpur	97,726	82.7	7.0	1.7	3.4	3.2	0.2	1.8
Baragaon	52,260	86.8	3.9	2.3	4.2	1.9	0.2	0.7
Pawayan	197,753	84.5	3.9	2.8	2.7	5.7	0.1	0.3
Khutar	128,563	69.8	3.4	0.9	2.7	22.7	--	0.5
Total District Budaun:	1292,580	83.1	3.5	0.9	3.8	5.7	0.1	2.9
Total District Shahjahanpur	1131,051	81.2	3.9	1.8	3.7	6.9	0.1	2.4

and Ramganga haveto be left uncultivated: this part of the land is also useful for the rural population, because it produces reed, locally known as ' <u>sarwa</u>' and ' <u>beend</u>' and the thatching grasses known as ' po<u>ola</u>', 'm<u>oonj</u>' and ' <u>kans</u>'--- which are used in thatched roofs in most of the rural houses.

The land occupied by settlement and roads is generally below 5 per cent everywhere except Katra and Shahjahanpur <u>parganas</u> (7.8 and 7 per cent). The proportion of land under groves nowhere exceeds 1.6 per cent of the total area in Budaun district. However, in the <u>parganas</u> of Shahjahanpur district is as much as 3 per cent. The cemetery and crematory possess only 0.3 per cent or below everywhere. All <u>pargana</u>s except Asadpur and Jalalabad, have less than 5 per cent waste land, while in the above two it is upto 8 per cent. Only 2.9 per cent of the area is the waste land in the whole district Budaun while it is lesser in the Shahjahanpur district, being 2.4 per cent of the whole. In the non-agricultural area, the forests and meadows occupy the largest percentage (5.7 and 6.9) in the area under review. It is followed in ranking percentage by land under water bodies and then under settlements and roads.

Land Classification

The area has been divided into various types of usages. The non-agricultural uses of land have also been dealt with. An attempt has been made to classify the agricultural lands in accordance with their fertility and productivity.

The good quality land consists of areas under which are double cropping and sugarcane production. The medium quality land is cropped in either the kharif season or the rabi season and is left fallow in the other season. The land which is put to fallowing for one or two years is also included in this catagory of land.

It will be seen from Fig.40 that the area under double cropping does not exceed 25 per cent to the total land under cultivation in the area. The table XIV shows that the good quality land varies from 12 to 41 per cent of the total area under cultivation. The area consisting of medium quality land varies from 59 to 88 per cent. The Table also reveals that 60 to 93 per cent of the total land under cultivation in the area remains unirrigated. The good quality land possessing higher productive efficiency varies in the district of Budaun from 13 to 33 per cent of the total cultivated land while in the district of Shahjahanpur its proportion increases upto 41 per cent; it is due to better rainfall conditions, lesser variability of rainfall and greater sources and facilities of irrigation in the latter district than the former.

Table XIV

Proportion of good quality and medium quality lands, and the unirrigated areas under cultivation, 1962-63

Parganas	Percentage of unirrigated area to the total land under cultivation	Good quality land		Medium quality land: Percentage to the total land under cultivation
		Total (acres)	Percentage to the total land under cultivation	
District Budaun				
Rajpura	78.0	22,004	32.5	67.5
Asadpur	84.2	85,861	28.4	71.6
Sahaswan	77.0	27,060	19.2	80.8
Kot	60.3	25,022	30.9	69.1
Islamnagar	67.6	21,218	27.5	72.5
Bisauli	60.0	16,327	21.4	78.6
Satasi	65.0	8,562	17.7	82.3
Budaun	76.7	14,372	13.1	86.9
Ujhani	80.1	19,631	17.4	82.6
Salempur	92.7	25,595	23.7	76.3
Usehat	85.0	18,961	19.8	80.2
District Shahjahanpur				
Khera Bajhera	91.2	10,067	21.0	79.0
Tilhar	77.7	14,397	21.7	78.3
Jalalpur	70.1	8,961	24.3	75.7
Nigohi	69.0	13,895	24.5	75.5
Katra	74.7	1,444	22.5	77.5
Jalalabad	75.7	28,253	17.3	82.7
Kant	76.4	8,682	12.4	87.6
Jamaur	74.4	13,485	29.9	70.1
Shahjahanpur	76.5	14,441	19.7	80.3
Baragaon	64.4	16,974	41.0	59.0
Pawayan	80.0	46,366	31.6	68.4
Khutar	91.7	27,237	34.8	65.2

IRRIGATION

The irrigation is done in both the kharif and rabi seasons. But in the kharif the greatest part of irrigation is shared by sugarcane, while the crop of transplanted rice may also be irrigated occasionally; ' its cultivation without irrigation is almost a gamble'[1], however, it is grown without irrigation for the most part.

For the year as a whole, most of the irrigation is done in the rabi season, when much of the continual crop of sugarcane is also irrigated in addition to the rabi crops.

LAND UTILIZATION IN THE KHARIF SEASON

The rainfall in the summer monsoon months, the kharif season, plays a very significant role in agriculture. If the rainfall is well distributed timely, all the kharif crops, with the exception of sugarcane, are grown well, mostly without irrigation.

It will be seen from Fig. 38 A that most of the cultivated areas in several parts of the two districts (Budaun and Shahjahanpur) have been cropped in the kharif season and the fallowing is confined to a small

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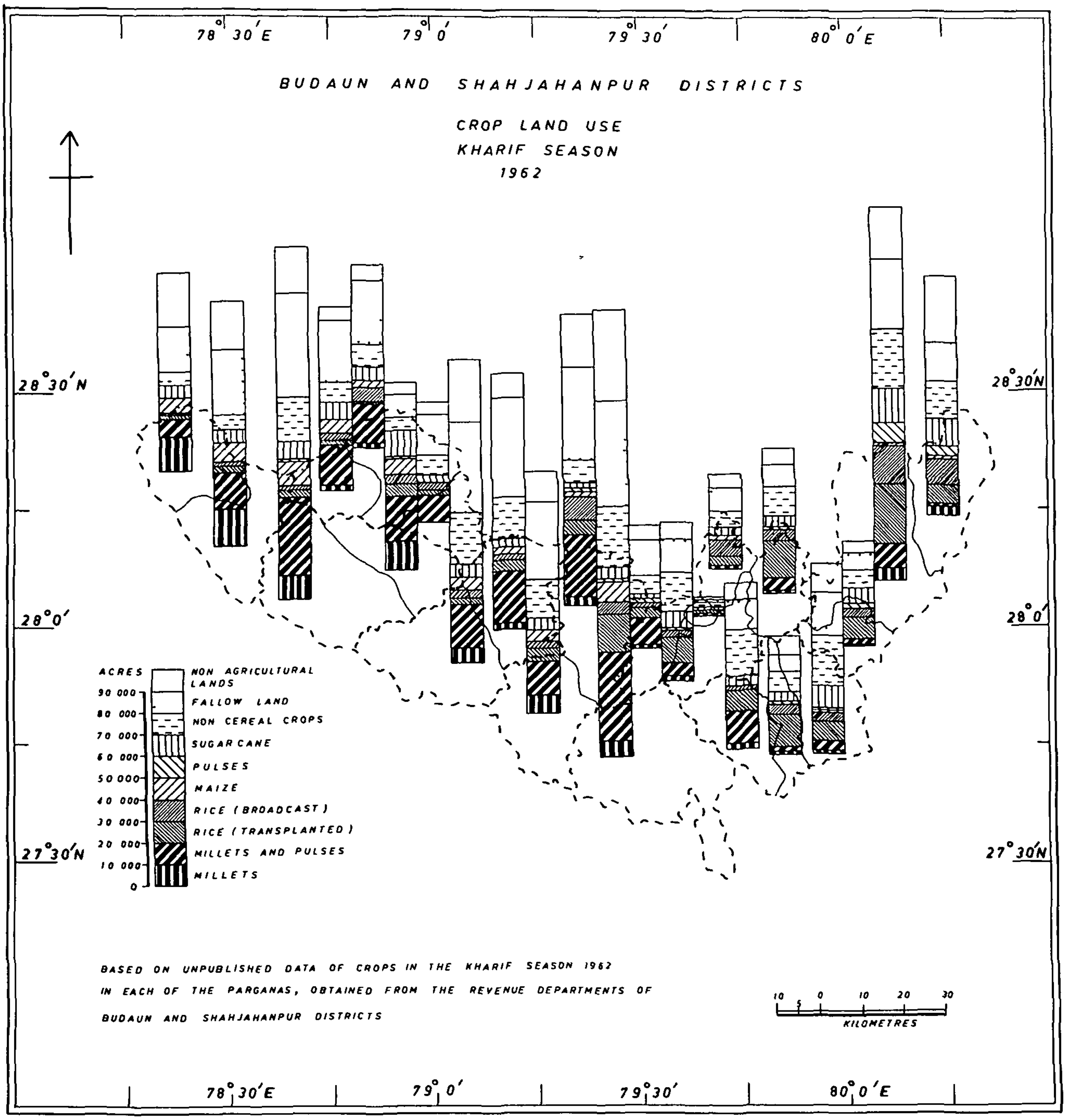
1. National Council of Applied Economic Research, Criteria for Fixation of Water Rates and Selection of Irrigation Projects (New Delhi, 1959), p. 128



78° 30′ E
79° 0′
79° 30′
80° 0′ E
BUDAUN AND SHAHJAHANPUR DISTRICTS
CROP LAND USE
KHARIF SEASON
1962
28° 30′ N
28° 0′
27° 30′ N
ACRES
90 000
80 000
70 000
60 000
50 000
40 000
30 000
20 000
10 000
0
NON AGRICULTURAL LANDS
FALLOW LAND
NON CEREAL CROPS
SUGAR CANE
PULSES
MAIZE
RICE (BROADCAST)
RICE (TRANSPLANTED)
MILLETS AND PULSES
MILLETS
BASED ON UNPUBLISHED DATA OF CROPS IN THE KHARIF SEASON 1962
IN EACH OF THE PARGANAS, OBTAINED FROM THE REVENUE DEPARTMENTS OF
BUDAUN AND SHAHJAHANPUR DISTRICTS
10 5 0 10 20 30
KILOMETRES

FIG 38 A

proportion of land in almost all the area under study. For instance, in Rajpura pargana, the net kharif cropped area is 60,597 acres or 89.6 per cent of the total land available for cultivation and the fallow land is 10.4 per cent. In Sahaswan pargana, the 95 per cent of the total land under cultivation was cropped in the kharif season, similarly 98.7 per cent in Bisauli, 97 per cent in Khera Bajhera; Tilhar, Jalalpur, Katra , Nigohi and other parts of the area have the same condition.

The cereal crops of the kharif season are big millet, bulrush millet, pulses (pigeon pea, arhar) rice-transplanted, rice-broadcast, maize, small millet. The crops of millets are mostly grown mixed with the pulses (arhar). The non-cereal crops are sugarcane, groundnut, oilseeds, fodder crops, green-manure crops, cotton and vegetables.

Among the cereal crops, millets-- grown alone or mixed with pulses (arhar) --- occupy the largest areas in most of the parganas of the area, particularly of Budaun district, whereas the southwestern part of Shahjahanpur district (Khera Bajhera, Jalalabad and Kant parganas) only has also largest cropping of this crop. The largest eastern and northeastern parts of Shahjahanpur district have the most dominating crop of rice, of both varieties of transplanted and broadcast.[1] It is indicative of the fact that greater rainfall and better irrigation facilities in the district of Shahjahanpur as compared to Budaun district prove very useful for rice cultivation. The crop of m maize is also an important crop, having the second position among kharif crops in the west-southwest of Budaun district.

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1. The broadcast rice, locally known as 'dhan' or satthi' is generally used after husking to prepare bread, being pinkish in colour ,while the transplanted variety of rice is itself boiled after husking.

Among non-cereal crops, sugarcane is the second largest of all the kharif crops in the eastern half of Shahjahanpur district and in a part in the middle west of Budaun district. With the exception of western-southwestern part of Shahjahanpur district (parganas Khera Bajhera, Jalalabad and Kant), the whole of the district has 9 to 17 per cent of the total agricultural land under sugarcane, while a small area in the middlewest of Budaun district (Islamnagar and Kot parganas) has 10 to 15 per cent under it. Groundnut is also an important cash crop in Budaun district, particularly the middle and southeastern parts (Ujhani, Usehat, Satasi, Sahaswan and Budaun parganas) have 19, 16, 13, 12 and 11 per cent of the total cultivated land under crop of groundnut respectively. The crop is not significant in the Shahjahanpur district, and occupies less than 1 per cent of the total cultivated land. Groundnut, occupies the medium quality land in contrast to lands occupied by Sugarcane. Groundnut is a major cash crop in the area between Ganga and Ramganga rivers while sugarcane is the major cash crop in between the Ramganga and Gomati rivers and trans-Gomati plain area.

LAND UTILIZATION IN THE RABI SEASON

The cold weather season, coinciding with the _rabi_ (crop) season, has little rainfall in the area. Irrigation, therefore, plays an important role in _rabi_ cultivation. Some of the _rabi_ crops are, however, grown without irrigation owing to non-availability of irrigation facilities.

Most of the cultivated area is cropped in the _rabi_ season, and there is a smaller proportion of fallow land in the _rabi_ season, than in the _kharif_ season,(Fig. 38 B).The fallow land in the _rabi_ season varies from 1 per cent to 11 per cent of the total area under cultivation. About 99 per cent of the cultivated area is cropped in the _rabi_ season in the northwest of district Budaun (Bisauli, Islamnagar, Kot and Satasi _parganas_). The largest area left as fallowing in the _rabi_ season is 7 to 9 per cent of the total cultivated land in the western and eastern portions of Budaun district (Rajpura, Salampur and Usehat _parganas_) .

In the district of Shahjahanpur, the whole of northwestern area (Tahsil Tilhar) has 96 to 99 per cent of total cultivated land under crops in the _rabi_ season, while in other parts of the district the percentage varies between 89 and 95.

A significant feature of _rabi_ crops is the mixed cropping, mostly of wheat-gram, wheat-barley, and barley-wheat-peas. Maximum cropping of wheat-gram mixed is in the north-northeast of Budaun district and the middle and western areas of Shahjahanpur district. This is the second largest _rabi_ crop in the southern _parganas_ of Budaun and northeastern parganas of Shahjahanpur district, where the first place is occupied by wheat.

In the western part of the area (Rajpura and Asadpur _parganas_), peas is the second largest _rabi_ crop after wheat.

It is second largest after wheat-gram in the middle-north of the area. This crop serves two purposes: before ripening, much of it is used as fodder; and after ripening its grain is obtained and is usually used as pulses or is milled in certain proportion with wheat and used as a flour.

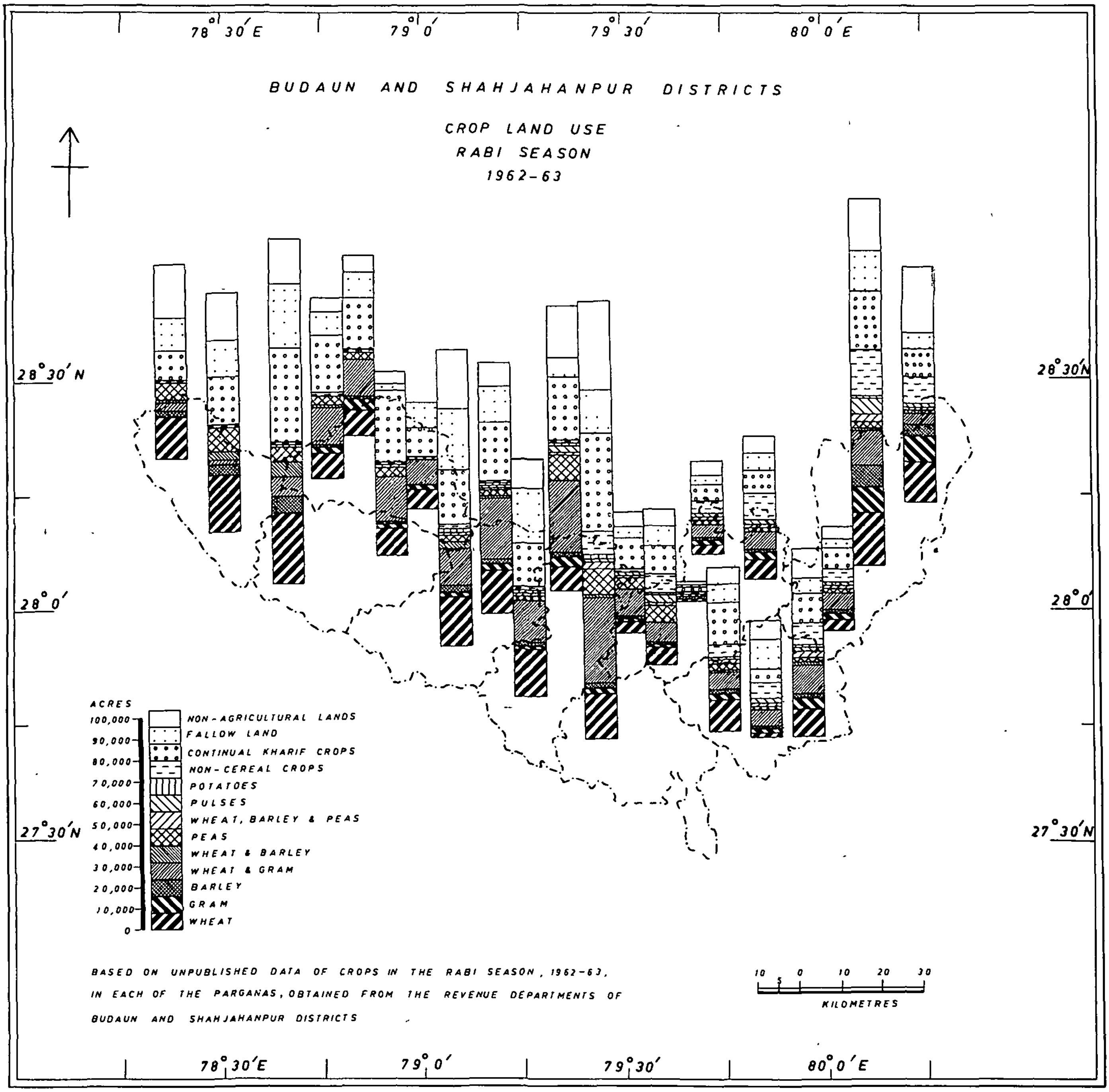
78° 30′ E
79° 0′
79° 30′
80° 0′ E
BUDAUN AND SHAHJAHANPUR DISTRICTS
CROP LAND USE
RABI SEASON
1962-63
28°30′N
28°0′
27°30′N
ACRES
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
NON-AGRICULTURAL LANDS
FALLOW LAND
CONTINUAL KHARIF CROPS
NON-CEREAL CROPS
POTATOES
PULSES
WHEAT, BARLEY & PEAS
PEAS
WHEAT & BARLEY
WHEAT & GRAM
BARLEY
GRAM
WHEAT
BASED ON UNPUBLISHED DATA OF CROPS IN THE RABI SEASON, 1962-63,
IN EACH OF THE PARGANAS, OBTAINED FROM THE REVENUE DEPARTMENTS OF
BUDAUN AND SHAHJAHANPUR DISTRICTS
10 5 0 10 20 30
KILOMETRES
78°30′E
79°0′
79°30′
80°0′E

FIG. 38 B

Gram is the second largest rabi crop in only the eastern portion of the area (Khutar pargana). It serves generally three purposes, firstly its tender leaves and small soft branches are picked up to use as vegetable particularly before the fruiting period of the crop; secondly , its grain is obtained for human use as flour and pulse; and thirdly , its straw is used as fodder.

The other crops of the rabi season are barley, pulses, (lentil mainly), barley mixed with peas and wheat, and potato. The maximum acreage of rabi pulses in Budaun district is found in the northeast part (Salempur pargana) whereas in the Shahjahanpur district the maximum acreage is in the north and northeast, (Tilhar, Nigohi, Pawayan and Khutar). Fig.38 B.

The crop of potatoes ~~is~~ produced mainly as cash crop. Potatoes ~~is~~ are largely exported to the towns and cities. The greatest areas of potato production lie in the heart of Budaun district (pargana Budaun, Ujhani and Kot) and the southern and southwestern parts of Shahjahanpur district (parganas Jalalabad and Shahjahanpur).

The other non-cereal rabi crops include the oilseeds, fodder crop and vegetables.

RANKING OF CROPS

The ranking of important crops of the area, through the percentage of total harvested cropland occupied by each crop, has served two purposes: first, it has given a picture of the relative positions of strength among the important crops of the year; and secondly, it has presented an areal distribution of different crops in relation to climatic and edaphic conditions.

The first ranking crops as shown in the first-place map (Fig.39) are millets and pulses, wheat-gram (mixed) and rice in the area. It will be seen from this map that the whole area extending from north-northwest to about the middle of the eastern half of the area (Shahjahanpur district) is occupied by the crop of millets and pulses (mixed); most of the area of this belt, particularly in the southwest, has sandy or sandy loam soil. Along the Ganga and Ramganga rivers, this is the largest <u>kharif</u> crop of the area. In addition, the district of Budaun, in which the crop is most dominant in the <u>kharif</u> season, has smaller rainfall and larger variability of rainfall than the eastern portion. The area under this first-ranking crop varies from 26 to 43 per cent of the total harvested cropland, and is higher in the northeast. In the north of this belt, the mixed crops of wheat and gram occupy the first rank where the soil is mostly loamy or clayey loam, and the rainfall conditions are better in this portion than the southwestern area. The area under wheat-gram with first ranking is 26 to 34 per cent of the total harvested cropland and is higher in the northeast of Budaun district. But in the central and eastern parts of Shahjahanpur district, the crop of rice has the first position of importance among the crops. The predominant soil is loamy or sandy loam but the rainfall in this portion is higher in the area with the least variability of rainfall. The land under rice varies from 20 to 51 per cent of the total harvested cropland and is higher in the canal irrigation zone.

The distributional pattern of crops in the second-rank map is disintegrated as compared to the first-place map. In the second-rank map, the crops of wheat and wheat mixed with gram are most dominant in the area. Where wheat and gram (mixed) occupy the first rank, millets and pulses occupy the second-rank with a percentage of 21 to 33 of the total harvested cropland.

The crop of wheat possesses the second rank in the western and southwestern large belt in the area, in the central portions (Katra and Kant parganas) and in the northeastern parts (Pawayan and Khutar parganas). In the western part, the percentage varies from 25 to 33 while in the eastern part it is from 18 to 25 of the total harvested cropland.

The second- rank map shows that the wheat -gram mixed occupies the second position in the middlenorth of Budaun district and in the central, western and southwestern parts of Shahjahanpur district, with the exception of two parts, Kant and Katra parganas. The area under wheat-gram varies from 17 to 28 per cent of the total harvested cropland.

A view of the third-rank map shows that the crops occupy more fragmented area than the first and second-rank maps. The third-rank map shows that the western portion of the area has peas as the third ranking crop, while the eastern and southeastern parts have sugarcane. The percentage of peas crop is 13, whereas sugarcane possesses 11 to 18 per cent of the total harvested cropland. Rice is the third ranking crop in the middle of the area. It occupies 14 to 18 per cent of the total harvested cropland. Maize, with a percemtage of 8, is the third-ranking crop in the southwest of Budaun district (Sahaswan pargana), while in the northwest of Shahjahanpur district, the mixed crop of millets and pulses occupies 13 to 17 per cent of the total harvested cropland and has third rank. Wheat has a large area as the third ranking crop in the middlenorth-northeast of Budaun district and in the southeast of Shahjahanpur district. It possesses 16 to 19 per cent of the cropland.

The third ranking mixed crop of wheat-gram occupies the land southeast of Budaun district and in the north-northeast of Shahjahanpur district. It has 12 to 21 per cent of the total harvested cropland.

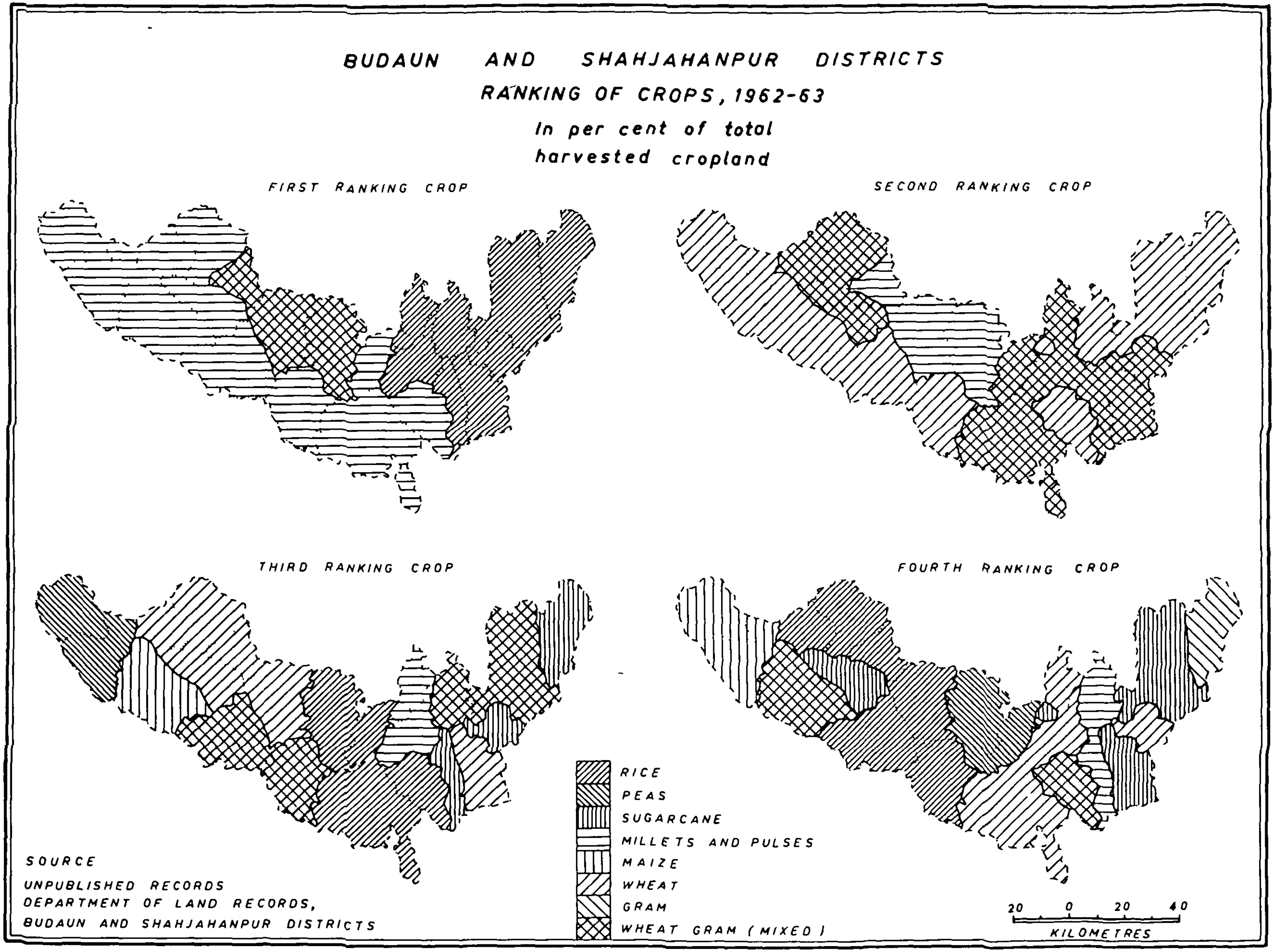
BUDAUN AND SHAHJAHANPUR DISTRICTS
RANKING OF CROPS, 1962-63
In per cent of total
harvested cropland
FIRST RANKING CROP
SECOND RANKING CROP
THIRD RANKING CROP
FOURTH RANKING CROP
RICE
PEAS
SUGARCANE
MILLETS AND PULSES
MAIZE
WHEAT
GRAM
WHEAT GRAM (MIXED)
20 0 20 40
KILOMETRES
SOURCE
UNPUBLISHED RECORDS
DEPARTMENT OF LAND RECORDS,
BUDAUN AND SHAHJAHANPUR DISTRICTS

FIG 39

The fourth-rank map of crops revealsthat rice, sugarcane and peas occupy the largest area as the fourth ranking crop individually in different parts. The crop of rice, occupying north-northeast and southeast of Budaun district, has 7 to 10 per cent of the total harvested cropland. The crop of sugarcane is found in the middle of Budaun district and in the eastern parts of Shahjahanpur district, which has a percentage of the occupied land as 11 to 15. The crop of peas occupying the central part of the area as a fourth ranking crop has an area of 10 to 12 per cent of the total harvested cropland. The western portion of the area is occupied by maize with an area of 11 per cent, while the eastern portion is occupied by gram with an area of 16 per cent of the total harvested cropland. Wheat occupies the western and central parts of Shahjahanpur district with an area of 12 to 14 per cent. The mixed crop of millets and pulses has an area varying from 9 to 14 per cent in the middle parts of Shahjahanpur district, while the mixed crop of wheat-gram occupies the south-southwestern areas in the two districts as the fourth-ranking crop and possesses 7 to 12 per cent of the total harvested cropland.

A comparison of the first and the second-rank map shows that the outstanding crops of the area are mixed crops of millets and pulses, wheat and gram, and the crops of rice and wheat. Millets and pulses are most significant in Budaun district and the southwest of Shahjahanpur district which has rice as the third ranking crop, leaving the second place for wheat-gram mixed; while the district of Shahjahanpur is mostly occupied by rice , wheat and wheat-gram mixed.

A comparison of the third-rank and fourth-rank maps reveals that sugarcane is larger in Shahjahanpur district than in Budaun district, while maize and peas are larger in Budaun than in Shahjahanpur district among low ranking crops of the area. Millets and pulses, which have the largest share in the first and second-rank maps occupying western half and the middle of the area, occupy a small area lying in only Shahjahanpur district among the low ranking crops (third and fourth-rank maps).

Rice occupies mostly first and partly third-rank in Shahjahanpur district. Wheat occupies mostly second and partly third rank in Budaun district. The mixed crop of wheat-gram, one of the major crops of the area, occupies a large proportion of the cultivated land as the first and second-ranking crop in the middle of the area and in the northeast of Budaun district.

DOUBLE CROPPED LAND

The lands which are cropped twice a year have better productive efficiency than those lands which produce one crop in a season, either kharif or rabi, and are left fallow to recuperate the fertility for cropping in the next season or year.

The area under double-cropping is not static, and changes from year to year in accordance with sufficiency or deficiency of manuring and irrigation to the agricultural land. With the increase in the facilities of manuring and irrigation, the percentage of the double cropped area is also increasing. Similarly shortage of manuring, rainfall and irrigation reduces the double-cropped land.

It will be seen from Fig. 40 that the area under double cropping varies from 5 to 25 per cent of the total land under cultivation; and thus the land cropped in one season of the year is at least 75 per cent of the total area available for cultivation. Fig. 40 shows that the western portion (Rajpura, Asadpur), eastern portion (Pawayan), central portion (Salempur) and southeastern parts (Jamaur and Baragaon parganas) have 20-- 25 per cent of the total cultivated area under double cropping. The western, eastern and middle parts of the area (Kot, Islamnagar, Khutar , Khera Bajhera and Nigohi parganas) have 15--20 per cent of total cultivated area under double cropping. The whole southwest, southeast, middle and the middlenorth of Budaun district (Sahaswan, Usehat, Budaun, Ujhani, Satasi and Bisauli parganas) and most of the western part of Shahjahanpur district (Tilhar, Katra, Jalalpur and Jalalabad parganas) have 10--15 per cent of the total cultivated area under double cropping; while Kant and Shahjahanpur parganas in the southeast of the area have 5--10 per cent of double cropped land.

Actual acreage of double cropped land in each part of the area and its percentage to the total area under cultivation are given in the Table XV. Acreage of the irrigated part of the double cropped area and its percentage to the total double cropped area are also given in it.

It will be seen from this Table that out of the total double-cropped area in each of the parganas (except the smallest pargana of Katra), a high proportion is unirrigated varying from 63 per cent to 100 per cent of the total double cropped area. The small percentage of irrigated land in the eastern part of Shahjahanpur district(Pawayan and Khutar parganas) is mostly due to sufficient annual rainfall in this area which occasionally leads to swampy conditions and such lands are known as ' tarai'; and about 92 per cent of the total land under cultivation is unirrigated.

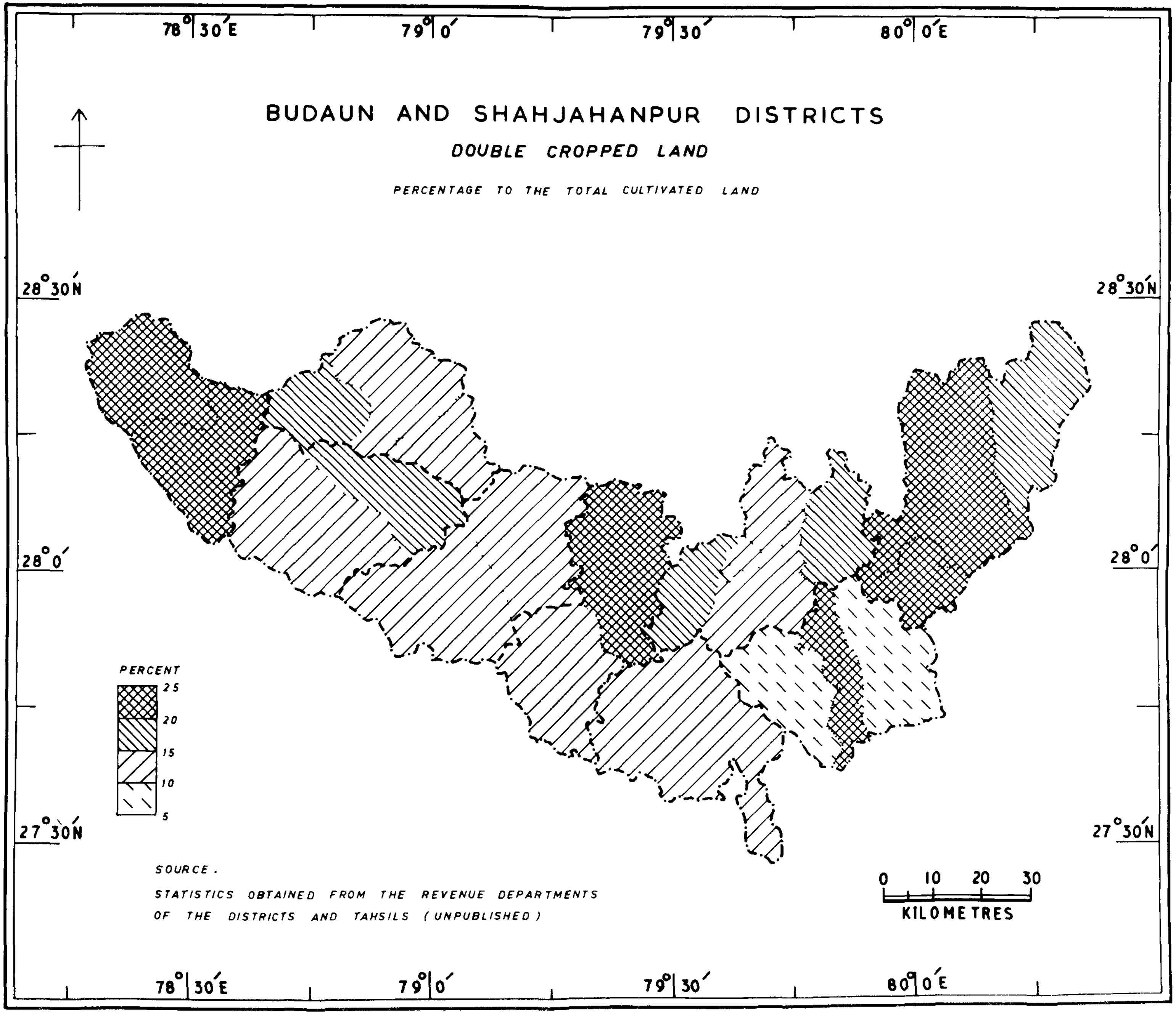
BUDAUN AND SHAHJAHANPUR DISTRICTS
DOUBLE CROPPED LAND
PERCENTAGE TO THE TOTAL CULTIVATED LAND
78°30′E
79°0′
79°30′
80°0′E
28°30′N
28°0′
27°30′N
PERCENT
25
20
15
10
5
SOURCE.
STATISTICS OBTAINED FROM THE REVENUE DEPARTMENTS
OF THE DISTRICTS AND TAHSILS (UNPUBLISHED)
0 10 20 30
KILOMETRES

FIG. 40

TABLE XV

Double Cropped Land, 1962-63

Pargana	Total area under double cropping (acres)	% of the double cropped area to the total cultivated land	Double cropped area irrigated (acres)	% of irrigated double cropped land to the total double cropped area	Double cropped area un-irrigated (acres)	% of unirrigated double-cropped land to the total double-cropped area
District Budaun						
Rajpura	15,854	23.5	858	5.6	14,996	94.4
Asadpur	19,787	21.8	275	1.4	19,512	98.6
Sahaswan	18,915	12.4	1,054	5.6	17,861	94.4
Kot	12,786	15.8	891	6.9	11,895	93.1
Islamnagar	13,463	17.6	1,453	10.8	12,010	89.2
Bisauli	10,542	13.7	498	4.7	10,044	95.3
Satasi	5,556	11.6	464	8.3	5,092	91.7
Budaun	11,229	10.2	682	6.1	10,547	93.9
Ujhani	13,830	12.3	783	5.7	13,047	94.3
Salempur	23,473	21.8	1,381	5.9	22,092	94.1
Usehat	14,133	14.7	501	3.6	13,632	96.4
District Shahjahanpur						
Khera Bajhera	8,375	17.5	2,358	28.1	6,017	71.9
Tilhar	7,839	11.7	300	3.8	7,539	96.2
Katra	709	11.1	412	58.9	297	41.1
Nigohi	8,979	15.9	883	9.8	8,096	90.2
Jalalpur	5,065	13.8	1,065	20.9	4,000	79.1
Jalalabad	23,295	14.3	1,542	6.6	21,753	93.4
Kant	5,025	7.1	1,864	37.3	3,161	62.7
Jamaur	9,226	20.4	1,676	18.2	7,550	81.8
Shahjahanpur	4,869	6.7	722	14.7	4,147	85.3
Baragaon	9,973	24.1	201	2.0	9,772	98.0
Pawayan	30,777	21.0	61	0.2	30,716	99.8
Khutar	14,864	19.1	22	0.1	14,842	99.9
Total	288,564		19,946	6.9	268,618	93.1

The small percentage of the irrigated area of the double-cropped land in Jalalabad pargana is due to the fact that a large part of its area has a high-water-table, the river Ganga and its tributaries traverse through most of its western-southwestern half, and the Ramganga river crosses the pargana in the middle. Thus the soil receives much of its moisture from beneath the surface, and irrigation is mostly not needed.

In double-cropped lands, the unirrigated areas are also of good quality soil. The irrigation is mostly done in the <u>rabi</u> season and the <u>kharif</u> crop irrigated in the double-cropped lands is only rice, particularly when the summer monsoon fails or delays.

The rotation of crops is also a significant feature of double cropping. There are certain rotations but there is no hard and fast rule observed by the cultivators with regard to rotation of crops. The <u>kharif</u> crop of transplanted rice is generally followed in <u>rabi</u> by wheat-gram mixed or only gram. The broadcast rice is rotated with wheat, wheat-peas, wheat-gram-barley, peas-gram or wheat-gram. The crop of maize is usually rotated with wheat in the <u>rabi</u> season. The crop of millets (without continual <u>kharif</u> pulses-'<u>arhar</u>') are followed by barley, peas, barley-peas, lentil or other pulses. The '<u>chari</u>'[1] crop is followed by wheat, gram or wheat-gram mixed, while the '<u>jowar</u>' by peas or barley-peas. Occasionally the maize crop is followed by potato or tobacco. If the maize crop is well-manured , it is generally followed by peas in the <u>rabi</u> season. If the <u>jowar</u> crop has been manured in the <u>kharif</u> , or the land is well-ploughed before sowing gram in <u>rabi</u>, the results are good for gram crop. Ample manuring is needed in sowing wheat after maize. The irrigated fields of rice are generally given to peas in the rabi season.

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1. The ' <u>chari</u>' is the forage crop obtained from the raw crop of big millet locally known as '<u>jowar</u>'.

CHAPTER VI

The Selection of Villages

One of the important problems about land use studies in India is related to the technique which should be adopted under Indian conditions and it should be worthwhile to consider this problem in the background of the techniques that have been adopted in other countries.

In Britain an attempt was made to make a systematic record of the then existing use of every acre of land by placing the appropriate letter (specified in a schedule) in its relevant place on the British Ordnance Survey map showing field boundaries and other features. Suitable colours were also assigned to different features.[1]

In the U.S.A., the unit area method of land classification developed by the Tennessee Valley Authority[2] recognized distinct areas of limited extent, each differing from its neighbours due to a combination of particular physical features and these combinations were recorded by a ' fractional notation system' which combined the use of numbers with the use of letters. The technique involved long fractions, short fractions and Roman numerals. The numerators of the long fraction referred to the method of land use and its general characteristics , while the denominator indicated the physical characteristics of the area. The tentative boundaries of homogeneous units were determined by examining large scale base maps and air photographs. The size of the unit varied with the type of the region and the scale of the base map.

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1. Stamp, L.D., The Land of Britain, its Use and Misuse , (London), 1948)pp.22-32 idem: Our Developing World , (London , 1960), pp. 152 and 155-57.
2. Hudson, G.D., " The Unit Area Method of Land Classification", Annals of the Association of American Geographers, Vol. 26, No.2, June, 1936, pp.99- 112, idem: " Methods Employed by Geographers in Regional Surveys," Economic Geography, Vol. 12, No.1, January, 1936, pp. 98- 104.

The Michigan Land Economic Survey collected information relating to soil, slope, vegetation and similar natural features with the purpose of evaluating the relative merits of the lands in respect of agricultural, recreational or other uses.[1]

The Rural Land Classification Programme of Puerto Rico made an attempt to indicate both land use characteristics according to its agricultural usefulness.[2]

The Soil Conservation Service of the U.S.A. prepared a number of maps showing detailed land use patterns and also indicating erosion, slope and soil types by index letters and numbers. The present stress of the U.S . Department of Agriculture is on Land Capability Maps in which the land is classified into eight catagories of which only four are suitable for cultivation.[3]

The land use survey conducted by J.L.Buck in China consists of the data collected from 16,786 farms scattered in 168 localities[4] which are part of 154 hasien lying in 22 provinces. The survey included the data relating to population, food, standard of living and marketing.

The land utilization survey conducted in Poland on county basis[5] in 1953 followed the principles of British Survey with more details of utilization of arable land. It is also proposed to publish a detailed map, on a scale 1:50,000 entirely based on field work in selected areas and as realised by the Polish Geographers, the detailed character of the Polish land utilization survey makes it impossible to cover large areas.

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1. Barnes, C.P., ' Land Resources Inventory in Michigan, Economic Geography, Vol. 5, No.1, January 1929, pp. 22-35.
2. Northwestern University, Department of Geography, The Rural Land Classification Programme of Puerto Rico, Northwestern University Studies in Geography, No.1, Evanston, 1952.
3. Raisz, E. Principles of Geography, (New York, 1962), p. 237.
4. Buck, J.L. , Land Utilization in China, (London, 1937),pp.VII-VIII.
5. Dziewonski, K. ' Detailed Survey of Land Utilization in Poland'— Proceedings of the International Geography Seminar, Department of Geography, Aligarh Muslim University, (Aligarh, 1956), pp. 562-66.

But in India, the agricultural conditions are rather different. In India the cadastral maps of villages showing field boundaries on a scale 1: 3960 are available. These maps are not published like the 6 inch British Ordnance maps, but usually a hand-drawn copy is maintained by the village accountant and copies of this map can be obtained on the availability of necessary sanction from the relevant authorities. Further, it would be most difficult, if not impossible, to record on the map the land use of every parcel of land belonging to all the villages of rural India, particularly when mixed cropping is a common practice and the size of farm units is microscopic. Even if these difficulties associated with the survey are overcome, the land use survey maps may be rendered out of date by the time they are completed and reduced to a suitable scale with documentary interpretation, and soon the need may arise to revise and recheck the survey. In view of these realities sampling technique seems to be the best for obtaining factual information in regard to the existing patterns and problems of land use. Such a technique would not lead us to a total land use picture relating to actual distributions in an area but will undoubtedly be helpful in certain respects. It will reveal clearly the land use problems which may be similar in areas having homogeneity in regard to physical and social conditions.[1]

It is, therefore, necessary to undertake a technique of the sample surveying. There are many types of sampling[2], out of which three are important: (1) the random or probability sampling; (2) systematic sampling, and (3) the purposive sampling. Simple random sampling means that each sample of 'n'

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1. Shafi, M., " Techniques of Rural Land Use Planning with reference to India", Paper presented at the 20th International Geographical Congress held in London, 1964: The Geographer, Vol. XIII , (Aligarh, 1966), pp.16-17.
2. ibid. p. 17.

units from a population of 'N' units has an equal chance of being selected and to ensure true randomness;the method of selection must be independent of human judgement and this is generally achieved by the use of random tables.

The cluster sampling deals with selecting a sample of villages, each single selection leading to a cluster of units (or fields). Then within each of the selected clusters one can include all the individual units which it comprises or only a sample of them, a complete enumeration of these clusters is then taken.[1]

In the National Sample Survey, a stratified two-stage sampling design with two independent and interpenetrating network of samples (IPNS) was adopted for land utilization survey. In each stratum villages, selected systematically with equal probability, were the first stage units and clusters of plots, selected systematically with equal probability from each of the selected villages were the second stage sampling units. For yield survey, a stratified 4- stage sample design was adopted. The sample villages, clusters of plots, plots and circular cuts of radius 4- feet were the successive units of sampling. There was integration of sample villages with respect to crop survey and socio-economic enquiries ; that is, the land utilization and yield surveys as well as the various socio-economic enquiries conducted in the same set of sample villages instead of in two different sets. The strata were formed within states by grouping contiguous tahsils which were homogeneous with respect to population density, altitude above sea level and food crops so that the strata populations were approximately equal. From each stratum two independent sub-samples of six villages each

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1. ibid., pp. 17-18

were selected systematically with equal probability after arranging the tahsils in a surpentine order. For land utilization survey in a sample village, generally six clusters of ten plots each were selected.[1]

In purposive sampling, the samples are selected as representative of the universe —— the total number of units in an area from which the samples are to be drawn ----. Once the general breakdown of the samples is decided on systematic lines, the choice of actual sample units is left to the investigators. Thus it is a method of stratified sampling in which the selection within the strata is non-random. Theoretically it may be less sound than random sampling but with adequate safeguards it can be made highly reliable and the extra cost of random sampling can be avoided. As in each stratum human factors affecting land use may vary in respect of farm management, accessibility and capital investment, the selection of villages on random basis for land use studies may lead to a less representative picture of the area than that obtained from purposive sampling.[2]

For purposes of this study the Systematic Purposive Cluster Sampling has been adopted. The physical factors affecting land use, i.e., relief, slope, drainage and soil have been carefully studied and on the basis of these factors the area has been subdivided as far as possible into homogeneous strata and from each stratum representative villages which include cluster of fields have been selected.

In selecting these villages care was taken to choose those villages which represented the typical physical conditions of the type of land from which these were selected. Further,on, care was taken to select at least

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1. The Central Secretriate: Govt. of India, The National Sample Survey, Fourth round, July, 1958- June 1959, No.73 (Delhi 1963),pp.3 -4.
2. Shafi , M., op.,cit., p. 18.

one village from each of the parts of one soil type lying in the western and eastern portions of the area; for instance, one village was selected from the sandy loam tract lying in the western portion as well as one from the eastern. Variations of rainfall in the western and eastern portions of one soil-type were also considered and villages were selected to represent such minute variations. For instance, one village has been selected from the western portion of the loamy soil tract which has a lower rainfall and one from the eastern portion of the same type of soil which has a higher rainfall, seasonally as well as annually; besides, another village has also been selected from the same soil group having the rainfall value in between the two.

In short, the fifteen villages selected for a comprehensive survey of agricultural land utilization cover almost every type of relief, drainage, soil, climate, conditions of availability of water, variabilities of soil fertility, types of crop rotations, and the resultant economic conditions.

The writer, thus, made two extensive visits to each of the selected villages in order to assess the nature of agricultural land use in them and to find out the existing deficiency diseases born out of their prevailing dietetics.

The first visit was made in the <u>kharif</u> season, 1962. Maps of the villages showing field boundaries were obtained and areas were noted from the respective Tahsil headquarters. On the outline maps, the writer recorded the actual land use of the season as witnessed by field-to-field observations. The villagers of the villages were asked each of the following questions and the questions regarding their diets.

1. What crops are being raised?(recording the various crops),

2. For what purpose are the crops grown? (i) cash crops, (ii) fodder crops, (iii) crops of foodstuffs, or (iv) green manure crops to raise the fertility of the soils?
3. What typical kinds of soil are found on the farms?
4. What crop-rotations are being followed on various types of soils?
5. What problems or difficulties are encountered in crop-production and soil conservation?

Each of the houses of the village was enquired about the incidence of different ailings and diseases, alongwith their obvious symptoms when necessary, and thus all the survey regarding morbidity and mortality was completed for the season. The villagers were also interrogated for the informations relating to the yield of different crops per bigha or per acre, types of crop-rotation, type and condition of agricultural implements used, methods of agricultural operations, means of irrigation, and general standard of living.

The same survey was operated again in the rabi season, 1962-63. And thus, for a detailed interpretation of existing use of land, the factual distribution of crops, other uses and non-use of lands were mapped out by the writer and their data have been calculated and tabulated accordingly, which have been given in the description of each village.

CHAPTER VII

THE SELECTED VILLAGES

The selected villages comprise five groups, classified on the basis of relief, drainage, types of soil and the availability of irrigation water. The location of the selected villages is shown in Fig. 41. Group I includes the villages of Salempur, Mullanpur, Asdharmai, Mohammadpur Azampur, Paindapur and Dhaka. The plains in which these villages lie are well-drained with a very gentle slope towards southeast in Budaun and towards south in Shahjahanpur districts. The soil is generally loamy and irrigation facilities are available. The underground water table is low. The villages of Mullanpur, Mohammadpur Azampur, and Dhaka are on the banks of seasonal rivers while Paindapur has a canal in the village area. The village Salempur represents the area of the loamy soil with lesser rainfall and lesser facilities of irrigation. Dhaka represents the area of relatively high rainfall. The villages of Asdharmai and Mohammadpur Azampur represent an area in between the two extremes. Paindapur village represents an area which is well-irrigated by canal: while in other villages there are no facilities of canal irrigation and irrigation is carried out by wells, tube-wells and ponds.

Group II. The villages of Junawai, Bichoula and Shamspur represent the sany loam (katil) soil tract. Junawai and Bichoula, lying in the western portion of the area, represent the area of relatively low rainfall, while the eastern portion of this tract has relatively high rainfall.

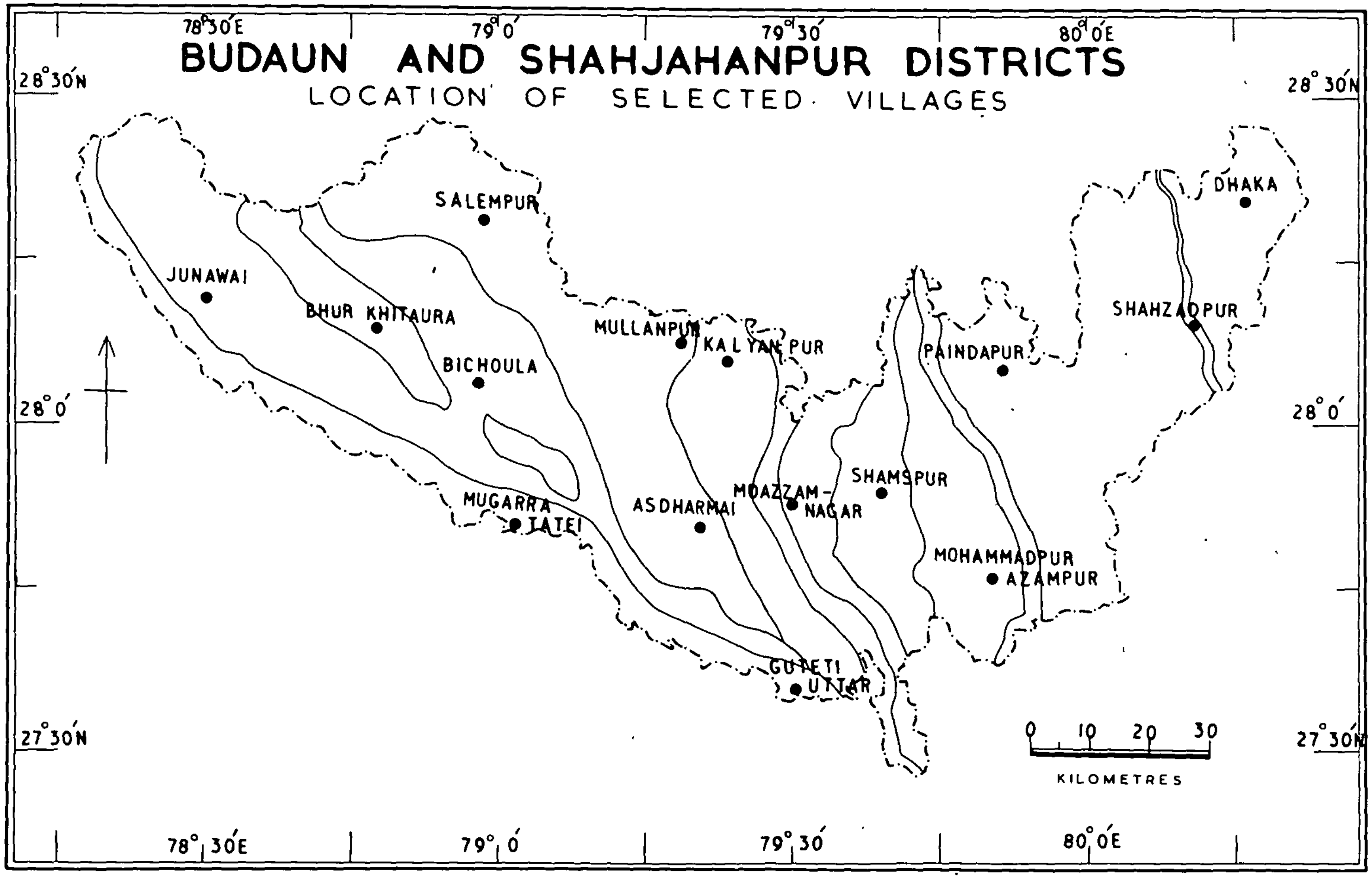
BUDAUN AND SHAHJAHANPUR DISTRICTS
LOCATION OF SELECTED VILLAGES
78°30'E
79°0'
79°30'
80°0'E
28°30'N
28°0'
27°30'N
SALEMPUR
JUNAWAI
BHUR KHITAURA
BICHOULA
MUGARRA
TATEI
MULLANPUR
KALYANPUR
ASDHARMAI
MOAZZAM-NAGAR
SHAMSPUR
PAINDAPUR
MOHAMMADPUR
AZAMPUR
GUTETI
UTTAR
SHAHZADPUR
DHAKA
0 10 20 30
KILOMETRES

FIG. 41

Group III. The clayey loam tract in the area under review is smaller than each of the above mentioned tracts. The area lies in the vicinity of western bank of Ramganga river. It is locally known as ' bankati' which means that the area was once under the forests (ban) which have been cleared off (kati), obviously for agriculture. This tract is represented by the village Kalyanpur. The tract is ill-drained and water-logging often occurs with a menacing character. While, on the other hand, the village Moazzamnagar represents the same type of soil tract with the different drainage conditions. This portion of the same type of land lies in the east of the Ramganga river. Its drainage conditions are not bad. This tract does not possess favourable conditions for sugarcane cultivation due to (1) greater proportion of clayey particles in the texture of the soil;(2) heavy and cloddy nature of the soil, particularly when dry, which results in root-suffocation; (3) lesser amount of bacterial and chemical action within the soil; and (4) loss of lime which is considerably washed off by the floods. Wherever such conditions do not occur, sugarcane is grown.

Group IV. The long narrow fringes of lands along the rivers of the Ganga, Ramganga, Deoha and Gomati are typically known as the khadar lands. The soil of the lands is mainly sandy consisting of new alluvium which is rejuvenated almost annually by the deposition of fine fertile silt (called ' Panga') brought by the river. The thin cover of the deposited silt is fertile and useful for crops. The villages of Mugarra Tatei, Guteti Uttar and Shahzadpur represent the khadar tract.The Ganga khadar is typically representative of such lands. The underground water table is high, often one metre or even less than that. Broadcast rice is generally grown. The crops usually do not need irrigation, particularly in the *khadar* of the Ganga and Ramganga. While, on the other hand, crops in the *khadar* of the Gomati need irrigation and are irrigated due to low underground water-table.

The Ganga *khadar* is represented by the villages Mugarra Tatei and Guteti Uttar. Mugarra Tatei needs no irrigation. It is situated just on the northern bank of the Ganga. But the village Guteti Uttar, being situated away from the bank of the Ganga, has a small percentage of irrigated land. The area under millets and pulses is small in Mugarra Tatei, but in Guteti Uttar rice (broadcast), millets, wheat and barley are the important crops. Quite different from the above two representative villages, Shahzadpur is situated in the land which has a low underground water-table, and is occasionally flooded by the Gomati river. Village Shahzadpur grows transplanted rice and gram.

No manuring is practised in the Ganga and Ramganga *khadar*, but the lands of the Gomati *khadar* village are manured. It is also remarkable that yield rates per acre of both *kharif* and *rabi* crops in the *khadar* lands are generally lower than in the villages of loamy or sandy-loam soils.

Group V. The last category of the tracts in the area is *bhur* soil. The *bhur* soil tract is found only in the western part of the area under review. This tract receives very little rainfall. The soil is sandy. Irrigation is necessary without which no crop can prosper, but there are no sufficient facilities of irrigation in this area. Many of the villages, hamlets and jungles have a prefix or suffix of *bhur* in their names. The village Bhur Khitaura is the selected village from this area. There is a high proportion of fallow lands and it is only with the help of well irrigation that some cultivation is carried on. The central or eastern parts of the area under review is devoid of any bhur soil. The production of kharif and rabi crops per acre in Bhur Khitaura is much less as compared to other villages.

It would be worthwhile to give some clarifications about the agricultural land use in the selected villages.

The crop year which begins from June and ends in May is divided into two main agricultural seasons: the kharif and rabi, the seasons of summer crops and winter crops respectively.[1] The kharif season usually begins in mid-June with the advent of the monsoon rains and lasts till October while the rabi season starts in November after the retreat of the summer monsoon and ends in the end of March. The period from April to Mid-June is devoid of cultivation except the cultivation of melons and water-melons in dry beds of rivers with the name of Zaid crop season.[2] The kharif crops need a high temperature and abundant supply of water unlike the rabi crops which require a cool weather and only a moderately small supply of water.

The other clarification is regarding the method of land classification. On the basis of fertility and productivity , the fields of every selected village have been classified and the maps have been drawn by the writer. During the course of his field work the writer visited the villages, made

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1. The kharif crops are sown in summer and harvested in autumn and the rabi crops are sown in winter and harvested in spring season. But in this work kharif season denotes the whole period during which the crops of summer monsoon season occupy the soil while the rabi season signifies the period during which the crops of winter season occupy the soil.
2. The Zaid crop season means the season of extra crops, i.e., which are occasionally cultivated in the dry river-beds during the dry summer months before the advent of monsoon. Melons, water-melons, cucumber and vegetables are raised in general.

enquiries and collected information on soil characteristics, on the availability of irrigation water or drainage conditions, on the supply of manures to and the crops grown or the fallowing practices in each field. Based on this investigation in each village, the village lands have been classified into the following four categories:

A- Good quality land,

BI)
B2) Medium quality land,

C- Poor quality land,

The good quality land is the best agricultural land in a village being under crops in both _kharif_ and _rabi_ seasons. The land producing sugarcane is also included in this type of land.

The area producing one crop of _kharif_ or _rabi_ during a crop year or the land under fallowing for one or two years and cultivated afterwards, is classed as medium quality land. The land which does not produce any crop and lies unused is classed as the poor quality land.

Some details regarding the characteristics of each group of land has been given in the land use study of each village.

LAND UTILIZATION IN SALEMPUR

LOCATION

The village[1] of Salempur is in Bisauli Tahsil[2] in the Budaun district. It is situated at 28° 18′ 54″ N lat. and 78° 54′ 16″ E.long. in a well-drained level plain, and is nearly 3.22 kilometres east of the town Bisauli. It is bounded by the villages Pindara, in the west; Banjariya, in the south; Parwez Nagar, in the north; and Painga Bhikampur, in the east, Fig.42.

An unmetalled road from Bisauli to the railway station of Dabtori goes through the middle of the village from southwest to northeast.

CLIMATE

Like all the other villages of the area, no climatic data are recorded in this village. The data of rainfall[3] for Bisauli, given in Tables XVI and XVII may be taken as a close approximation of the rainfall conditions of the area for an assessment of its influence on the type and extent of cropland use in the village.

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1. Throughout this work the word village denotes the area under settlement, roads and other uses alongwith the land under cultivation; the site of dwellings is termed as village settlement.
2. Tahsil is the administrative sub-division of a district.
3. No climatic data, except rainfall, are recorded at any headquarters of the tahsils in Budaun district.

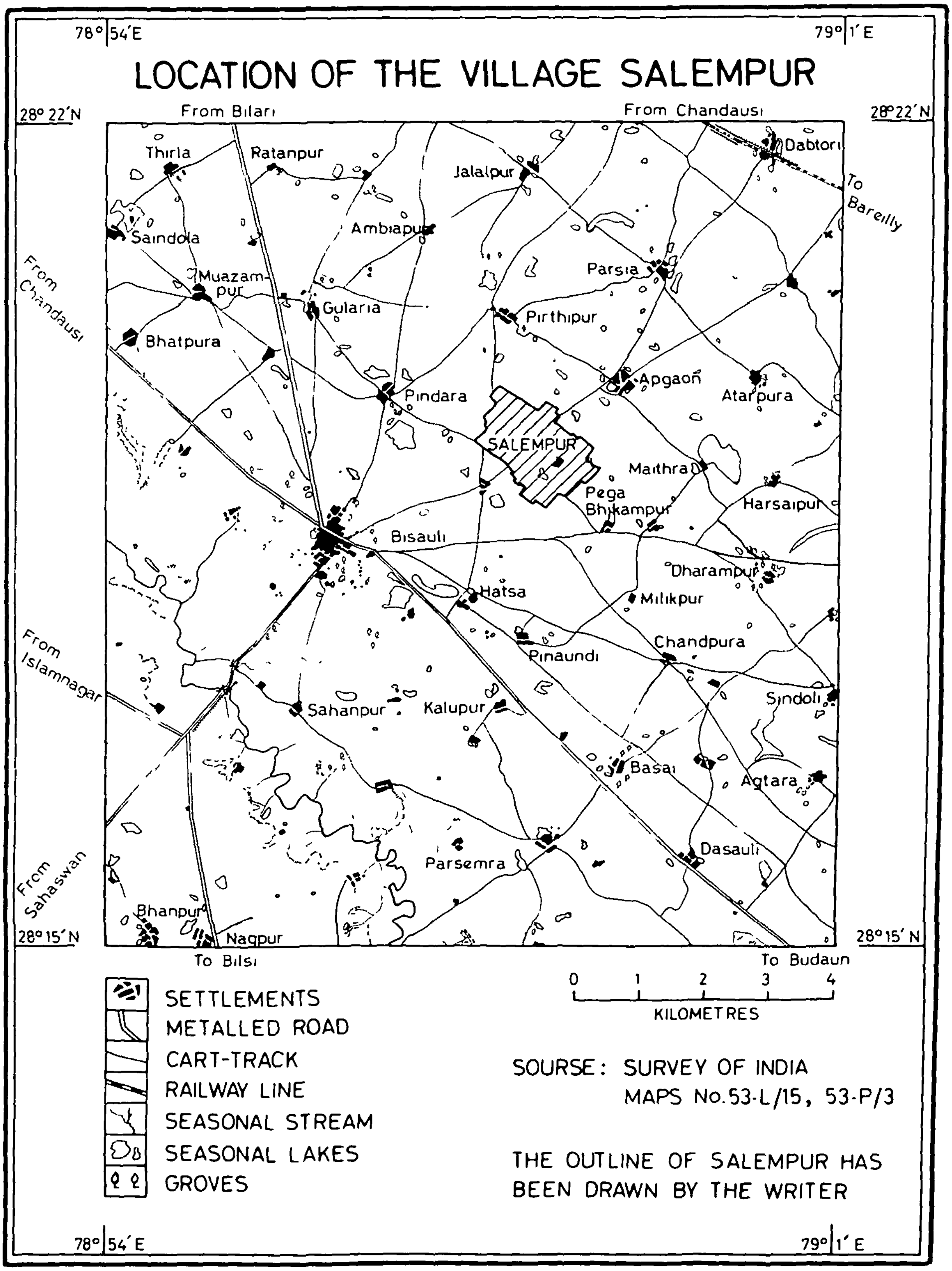
78° 54′E
79° 1′E
LOCATION OF THE VILLAGE SALEMPUR
28° 22′N
From Bilari
From Chandausi
28°22′N
Thirla
Ratanpur
Jalalpur
Dabtori
To Bareilly
Saindola
Ambiapur
Parsia
From Chandausi
Muazampur
Gularia
Pirthipur
Bhatpura
Apgaon
Atarpura
Pindara
SALEMPUR
Maithra
Pega Bhikampur
Harsaipur
Bisauli
Dharampur
Hatsa
Milikpur
From Islamnagar
Chandpura
Pinaundi
Sindoli
Sahanpur
Kalupur
Basai
Agtara
Dasauli
Parsemra
From Sahaswan
Bhanpur
Nagpur
28°15′N
28°15′N
To Bilsi
To Budaun
0 1 2 3 4
KILOMETRES
SETTLEMENTS
METALLED ROAD
CART-TRACK
RAILWAY LINE
SEASONAL STREAM
SEASONAL LAKES
GROVES
SOURSE: SURVEY OF INDIA
MAPS No.53-L/15, 53-P/3
THE OUTLINE OF SALEMPUR HAS BEEN DRAWN BY THE WRITER
78° 54′E
79° 1′E

FIG.42

Table XVI

Rainfall in the Kharif season, 1962 (Bisauli)

	MONTHS					
	June	July	Aug.	Sept.	Oct.	Total
Rainfall in milimetres in the kharif season, 1962	91.4	219.5	318.8	202.7	-	832.4
Rainy days in kharif, 1962	6	17	16	8	-	
Average rainfall in milimetres	25.4	270.0	261.0	161.7	49.7	817.8

The rainfall in June was three times more than the average. The rainfall in July was less than the average. But in August and September it was higher than that of the monthly average. But October was rainless.

Table XVII

Rainfall in the rabi season, 1962-63 (Bisauli)

	MONTHS					
	Nov.	Dec.	Jan.	Feb.	March	Total
Rainfall in milimetres in the rabi season, 1962-63	-	1.0	11.9	7.9	10.0	30.8
Rainy days in rabi, 1962-63	-	1	2	1	4	
Average rainfall in milimetres	2.7	6.9	20.8	27.3	11.7	69.4

The rainfall in all months was below average. It was nil in November, and was quite deficient in December, January and February.

LAND CLASSIFICATION

The village fields have been classified in Fig.43 according to their fertility and productivity.[1] The soil of the good quality lands (A) is mainly loamy. Its area is 262.438 acres.[2] It is 66.99 per cent of the total cultivated land in the village. It is well-drained and irrigated from tube-well, ponds and wells. These lands are cropped in both kharif and rabi seasons. A considerable proportion of these lands is also cultivated with sugarcane, a continual annual crop, which yields more on these lands than on the other lands of the village. The soil around the settlement is mostly first class loamy, locally known as 'gouhani' covering one-eight of the total cultivated land.

The medium quality lands are sub-divided into BI and BII lands which are less productive than A. Both of the medium quality lands are generally cropped in one season and are left fallow in the subsequent season.[3] The BI soil is sandy loam while BII soil is generally clayey loam. The BII soil has a higher capacity to retain moisture than any other soil of the village. It is devoted to two crops of rice and gram, in general. There is no land in the village unutilized (C).

IRRIGATION

The cultivated lands have been divided into irrigated and unirrigated[4] lands, which are demarcated in the Fig.44. The area irrigated in rabi

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1. The cultivated lands having best fertility and productivity are cropped twice a year or are put under sugarcane cultivation: they are classed as good quality (A) lands. The productive efficiency of such lands is highest.
2. The village areas of crops and other types of land are generally recorded still in acres by all Revenue Departments and Offices of the districts.
3. The fallowing is locally termed as 'parti' land.
4. The information regarding irrigation was obtained by the writer during his visits to the village in the kharif and the rabi seasons of 1962-63.

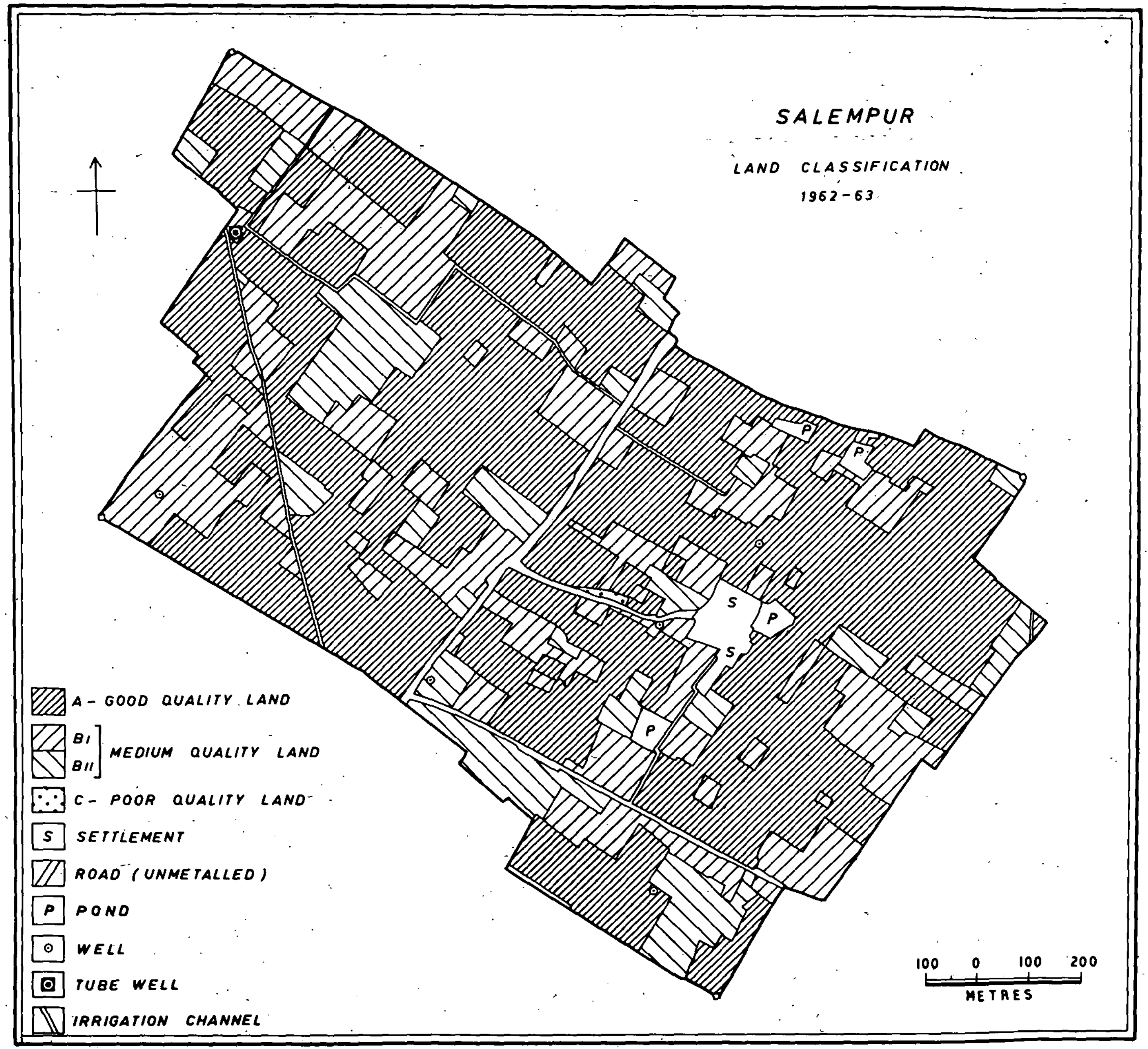
SALEMPUR
LAND CLASSIFICATION
1962-63
S
P
S
P
P
P
A - GOOD QUALITY LAND
BI
BII
MEDIUM QUALITY LAND
C - POOR QUALITY LAND
S
SETTLEMENT
ROAD (UNMETALLED)
P
POND
WELL
TUBE WELL
IRRIGATION CHANNEL
100 0 100 200
METRES

FIG. 43

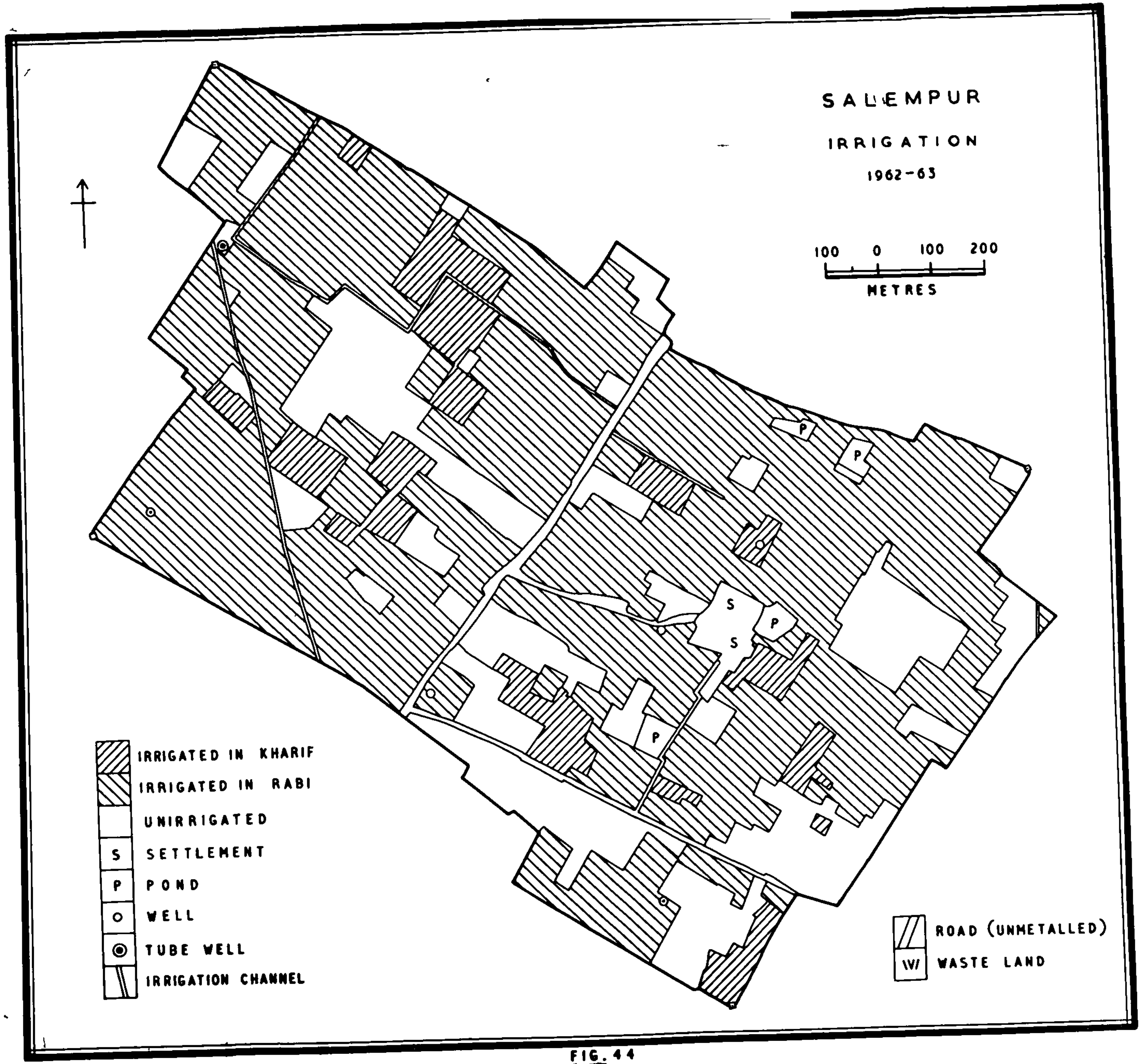
SALEMPUR
IRRIGATION
1962-63
100 0 100 200
METRES
S
P
IRRIGATED IN KHARIF
IRRIGATED IN RABI
UNIRRIGATED
SETTLEMENT
POND
WELL
TUBE WELL
IRRIGATION CHANNEL
ROAD (UNMETALLED)
W WASTE LAND

FIG. 44

season is larger than that of the kharif season, due to shortage of rainfall in the rabi (see Table XVII). Tube-well, ponds and wells are the main sources of irrigation. The rainfall figures (Table XVI) show the total average rainfall from June to October as 817.8 millimetres which is an adequate amount for the kharif crops except sugarcane[1], which is irrigated in the late kharif season also, owing to its greater water requirement. Irrigation, where available, is provided to sugarcane and rice, when monsoon rainfall ceases prematurely or a long break in rainfall occurs. The total rainfall in the period from June to October in the year of inquiry was 832.4 milimetres which was more than the average (Table XVI). The rainfall was well-distributed except in October which was rainless. Only 30.938 acres or 10.05 per cent of net sown area (sugarcane) was irrigated in the kharif season.

In the rabi season there was no rainfall in November and nearly the same in December (Table XVII). Total rainfall of the rabi season (30.8 milimetres) was very scanty being less than half of the average amount (69.4 milimetres).

The average rainfall of the season is not adequate for the rabi crops, therefore, one or two waterings are needed for crops. As a result most of the crops are irrigated in the rabi season, except those fields where irrigation facilities are not available. The crops of wheat, gram and vegetables are generally irrigated while barley and peas are only occasionally irrigated. Nearly more than half of the village in the western part is largely dependent on tube-well irrigation and partly on wells, but the area north, south and east of the village settlement is mostly irrigated from ponds.

1. Sugarcane occupies the land in both the kharif and rabi seasons. It is sown in the period from February to April and is harvested in the months of December to April.

Non-masonry wells are dug at times for irrigation temporarily. The depth of underground water-table remains at about 4.6 metres in the cold weather season (<u>rabi</u> season). The tube-well irrigates generally 2 acres in one day and night, while irrigation from either a pond or a masonry-well through Persian wheels and '<u>pur</u>' method can be provided only to about half an acre in one day.[1]

LAND UTILIZATION

The cultivated fields and lands under other uses in the year 1962-63 are shown in Fig. 45. The area and percentage to the total area, occupied by each broad type of land use, is given in Table XVIII.

Table XVIII

Total area of the Village ... 409.431 acres

Use of land	Area in acres	Percentage to the total area
Cultivated land	391.713	95.67
Settlement	4.281	1.05
Grove	4.434	1.08
Cart-tracks	4.066	1.00
Pond	3.531	0.86
Irrigation channel	1.406	0.34
Total ...	409.431	100.00

It will be seen from the above Table that the total cultivated area covers 95.67 per cent of the village, and other uses of land have only 4.33 per cent. The fuel supply to the village from groves is very meagre,

1. The cost of irrigation per acre in the year of inquiry was from:

Tube-well :	rupees 13
Masonry well :	rupees 16
Pond :	rupees 10

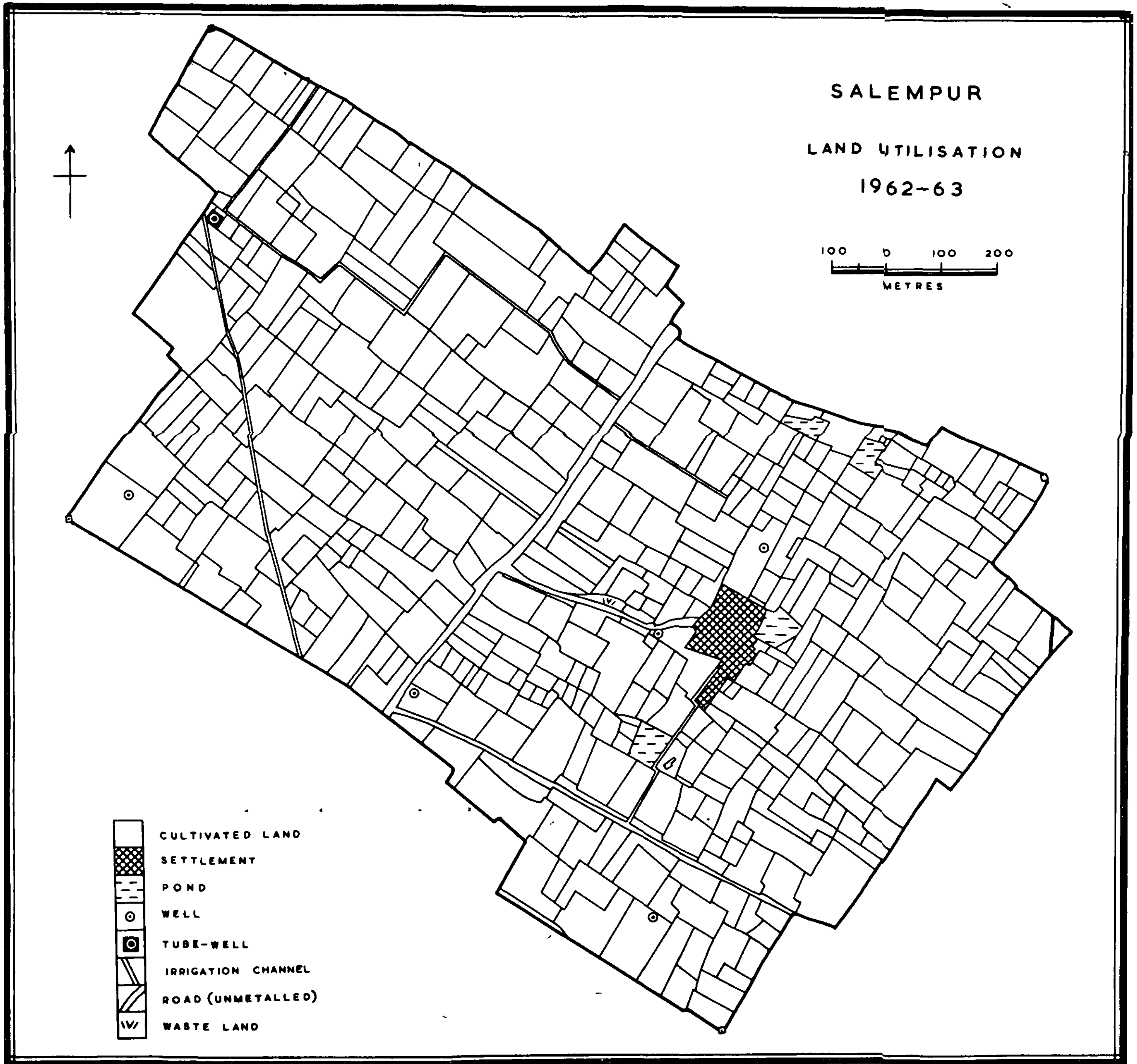
SALEMPUR
LAND UTILISATION
1962-63
100 0 100 200
METRES
CULTIVATED LAND
SETTLEMENT
POND
WELL
TUBE-WELL
IRRIGATION CHANNEL
ROAD (UNMETALLED)
WASTE LAND

FIG. 45

hence it is a general practice to burn dung-cakes as fuel. There is no waste land in the village. The fields are generally rectangular in shape and smaller in size in the good quality (A) lands as compared to the medium quality lands.

LAND UTILIZATION IN THE KHARIF SEASON

The distribution of crops and other occupations of land in the kharif season, 1962, are shown in the Fig. 46. The summary of the area occupied by each crop and its percentage to the total cultivated land and to the net cropped land are given in Table XIX.

The Table shows that 58.46 per cent of the total land under plough is sown with grain in kharif season, 20.16 per cent is under non-cereal crops while 21.38 per cent is left fallow in the season. The cereal crops occupy 74.42 per cent of the kharif sown area. Bulrush millet sown alone as well as mixed with other crops is the staple diet of people and occupies the largest area of the net cropped land in the kharif season. Pulses (pigeon pea)[1], sown mixed with bulrush millet, has the second largest area cropped. Groundnut, alone and mixed with bulrush millet, possesses the largest area of all non-cereal crops, allowing second place to sugarcane. The 19.36 per cent of the net sown area in kharif season is under mixed crops. Bulrush millet, grown alone and mixed with other crops, occupies 55.9 per cent of the net sown area of the season; and pulses (pigeon pea) occupy 11.6 per cent or the second largest share of the kharif sown crops. The people of the village obtain the largest amount of calories (Table XXII B) from bulrush millet, sugarcane, rice, maize and pulses and they generally suffer from the diseases of fat

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1. Locally known as 'arhar', its botanical name is Cajanus indicus.

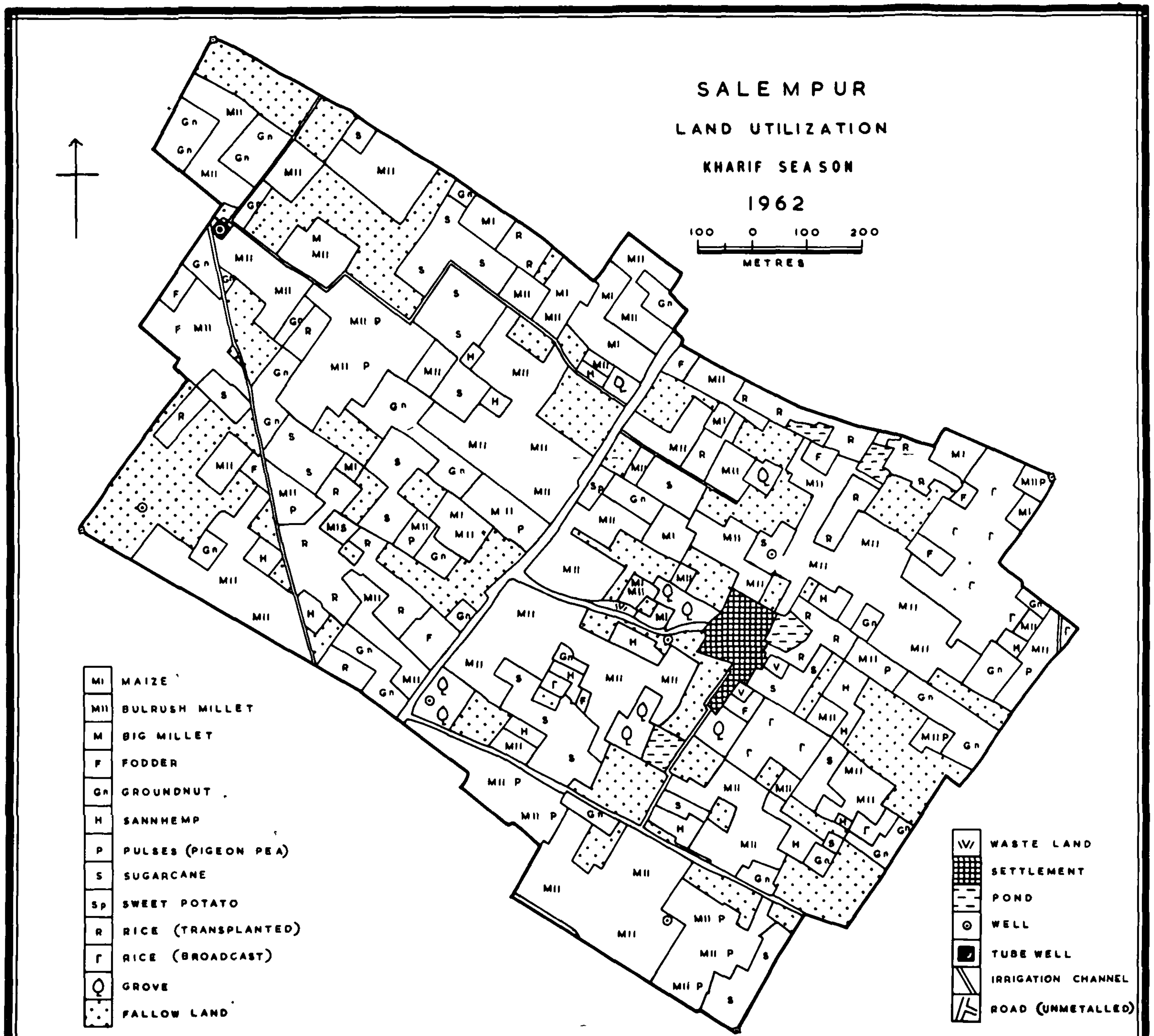
SALEMPUR
LAND UTILIZATION
KHARIF SEASON
1962
100 0 100 200
METRES
Ml MAIZE
Mll BULRUSH MILLET
M BIG MILLET
F FODDER
Gn GROUNDNUT
H SANNHEMP
P PULSES (PIGEON PEA)
S SUGARCANE
Sp SWEET POTATO
R RICE (TRANSPLANTED)
r RICE (BROADCAST)
GROVE
FALLOW LAND
WASTE LAND
SETTLEMENT
POND
WELL
TUBE WELL
IRRIGATION CHANNEL
ROAD (UNMETALLED)

FIG. 46

deficiency, protein deficiency, and vitamin C,D and A deficiency. Due to shortage of rainfall and high cost of irrigation, only 7.9 per cent of the total cultivated land[1] remains under sugarcane, yet the outturn fulfills the needs of the people. Only medium quality lands(BI)in the village are devoted to <u>arhar</u> (pigeon pea). Groundnut, 11.2 per cent of net <u>kharif</u> sown area, is a cash crop, sown in the medium quality land of the village. Most of the yield is exported to Bisauli. The other small crops include fodder, sannhemp and vegetables. The main fodder crop is '<u>chari</u>'[2]. The sannhemp[3] is drawn from the bark of the plant and the barkless stems are used as a fuel. The least area under <u>kharif</u> crop is of vegetables, being only 0.15 per cent of the net cropped area. A very large area (21.38 per cent of the total cultivated land) remains as fallow.

<u>LAND UTILIZATION IN THE RABI SEASON</u>

Fig. 47 depicts agricultural and other uses of land in the <u>rabi</u> season of 1962-63. A summary of the area occupied by each crop and its percentage to the total cultivated land and to the net cropped land are given in Table XX.

It is evident from the Table that the rabi cropped area is less than the kharif-cropped area, and the proportion of the fallow land is also less than that of the fallow land in the kharif season, and only 65.15 per cent of the total cultivated land is cropped in the season. It

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1. The total cultivated area has hardly changed since last three settlement operations. It was 390 acres in 1893-94, 395 acres in 1924-25 and 391 acres in 1935-36 (Assessment Statements, pargana Bisauli, Vol.VI, P to T, English Records, district headquarters of Budaun, unpublished), pp. 172-73.
2. The fodder crop harvested of green Jowar crop (big millet) is '<u>chari</u>'.
3. Locally known as '<u>sann</u>', its botanical name is <u>Crotaria juncea</u>.

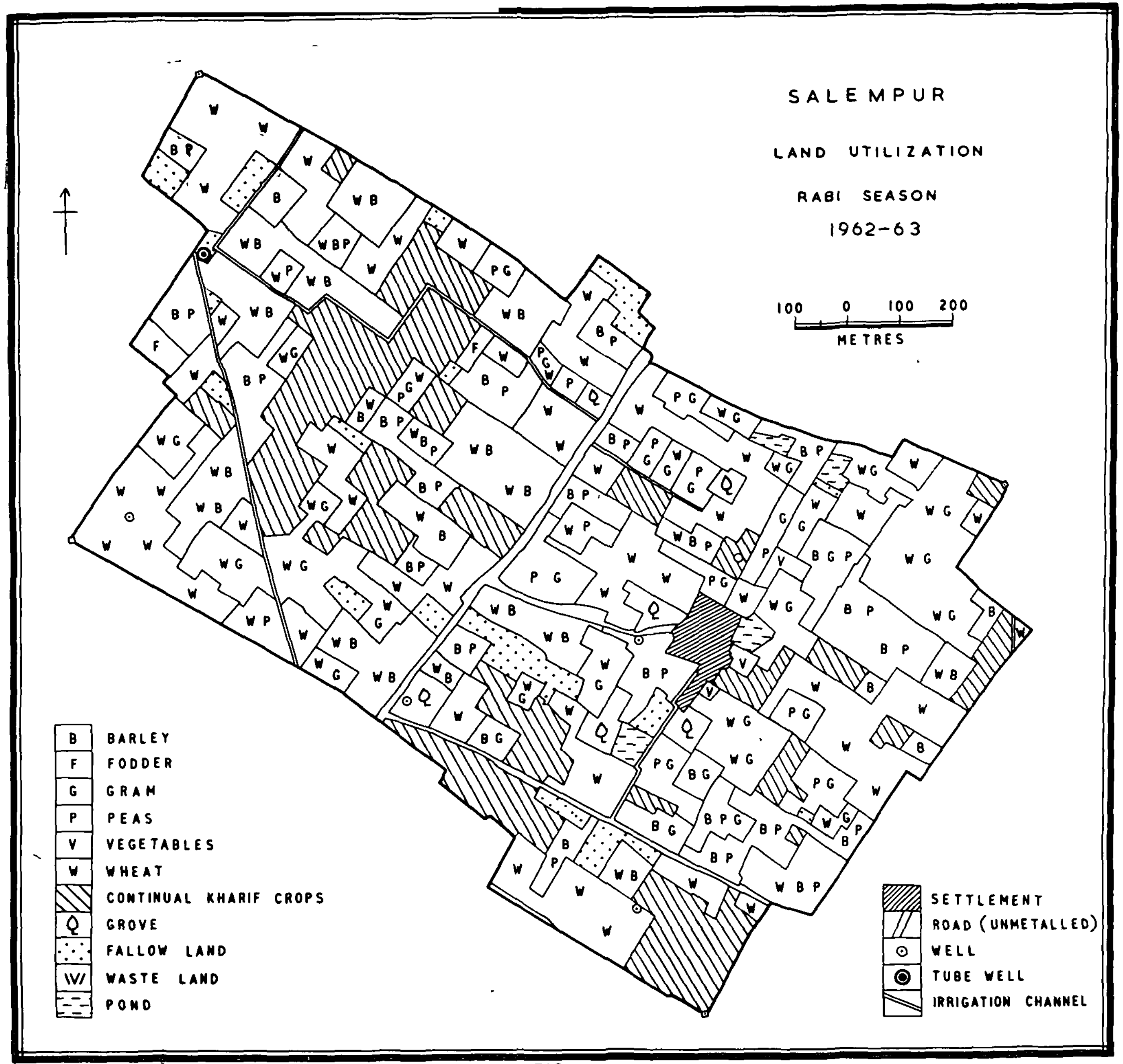

SALEMPUR
LAND UTILIZATION
RABI SEASON
1962-63
100 0 100 200
METRES
BARLEY
FODDER
GRAM
PEAS
VEGETABLES
WHEAT
CONTINUAL KHARIF CROPS
GROVE
FALLOW LAND
WASTE LAND
POND
SETTLEMENT
ROAD (UNMETALLED)
WELL
TUBE WELL
IRRIGATION CHANNEL

FIG.47

Table XX

Total Cultivated land ... 391.713 acres
Net cropped land in the rabi season ... 255.185 acres

Crops	Area in acres	Percentage to the total cultivated land	Percentage to net cropped land	Total percentage to total cultivated land	Total percentage to net cropped land
Grain Crops				64.63	99.20
Wheat	71.969	18.37	28.20		
Wheat and gram	51.844	13.24	20.31		
Wheat and barley	43.438	11.09	17.02		
Barley and peas	42.094	10.75	16.50		
Peas and gram	16.625	4.25	6.51		
Wheat,barley and peas	11.656	2.97	4.57		
Barley,peas and gram	5.125	1.31	2.01		
Barley and gram	4.500	1.15	1.76		
Wheat and peas	2.594	0.66	1.02		
Wheat,gram and peas	2.045	0.52	0.80		
Barley	1.250	0.32	0.50		
Other Crops				0.52	0.80
Vegetables	2.045	0.52	0.80		
Fallow	69.884	17.84	-	17.84	
Continual kharif crops	66.644	17.01		17.01	
Total	391.713	100.00	100.00	100.00	100.00

is because 17.01 per cent of the total cultivated land is already occupied with continual kharif crops in the rabi season. Of the net cropped land in this season, 99.2 per cent is under cereal crops in which wheat has largest area (28.2 per cent) of the net cropped land, while second, third and fourth in rank are mixed crops of wheat and gram, wheat and barley, and barley and peas. Barley, sown alone, does not occupy significant area. Wheat has the fourth value in the daily caloric intake per head per day, allowing the mixed crop of wheat and barley to take the second rank.

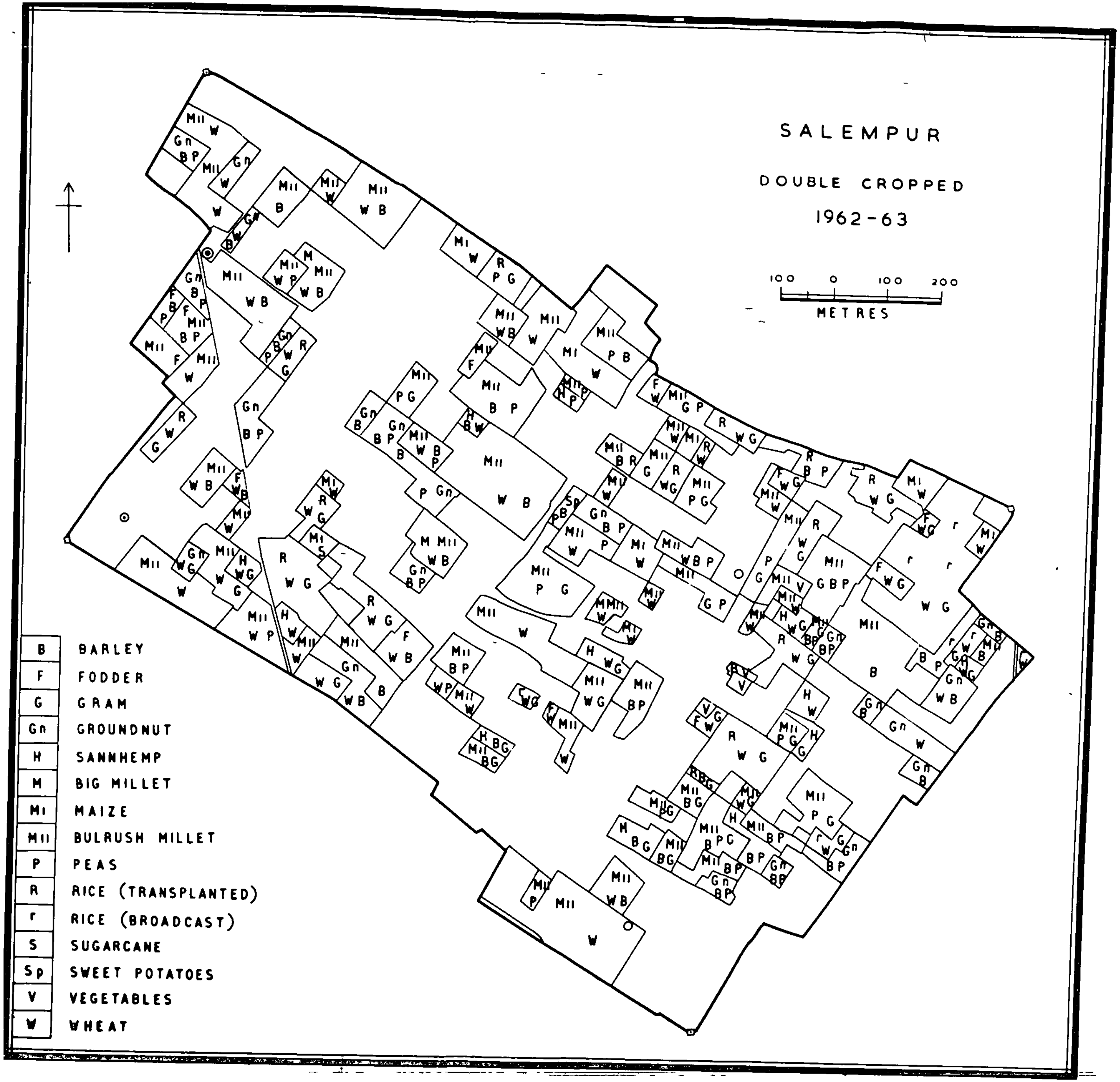
It is remarkable that 70.5 per cent of the net cropped land of the season is devoted to mixed cropping. Wheat, gram[1], barley, peas feature prominently in the mixed crops. The continual kharif crops include '<u>arhar</u>' (pigeon pea) and sugarcane.

<u>Vegetables</u>: Though the village is situated at a little distance from town Bisauli, yet market-gardening is not significant. Market gardening can be profitably carried out only if irrigation facilities are available.

<u>Double Cropped Land</u>:

The fields cropped twice in the year 1962-63 have been shown in Fig.48. The double cropped area is 231.5 acres which is 59.9 per cent of the total cultivated land of the village. Double cropping is practically sufficient in the village. All the lands cropped twice in the year possess the good quality (A) soil. The area under double cropping is not permanent, as it can be well increased through land improvement by manuring and irrigation. The crops: maize, rice (transplanted and broadcast) and bulrush

1. The local adage of the village says: '<u>Jab sail khatakhat baje to chana khub hi saje</u>', which means the gram's crop flourishes well when the soil becomes lumpy.


SALEMPUR
DOUBLE CROPPED
1962-63
100 0 100 200
METRES
B BARLEY
F FODDER
G GRAM
Gn GROUNDNUT
H SANNHEMP
M BIG MILLET
Mi MAIZE
Mii BULRUSH MILLET
P PEAS
R RICE (TRANSPLANTED)
r RICE (BROADCAST)
S SUGARCANE
Sp SWEET POTATOES
V VEGETABLES
W WHEAT

millet, sown in the kharif, are replaced by the crops: wheat, gram and barley and peas in the rabi season respectively. Generally the crops of bulrush millet, rice, maize, wheat, gram and barley are dominant in double cropping. The double cropped area per head of village population is 0.507 acre, as is given in Table XXI.

ROTATION OF CROPS

In accordance with the soil characteristics, climatic conditions, irrigation facilities, manuring provisions and the customary agricultural practices, certain rotations of crops are seasonwise adopted. They may be different from those in other villages. No hard and fast rules are there to choose the crops year after year. The following practice is generally followed:

generally followed.

	Kharif season	Rabi season
First year	Rice/ sugarcane	wheat and gram/ sugarcane (cont.)
Second year	Millets/ sugarcane (cont.)	barley and peas/ sugarcane.
Third year	Millets and pulses (pigeon pea etc.)	pulses (pigeon pea) (cont.)

The above practice of crop rotations relates to the good quality (A) lands. But the rotations in the medium quality (BI) lands are different:

	Kharif season	Rabi season
First year	millets and pulses (pigeon pea) continued	pulses (pigeon pea) (contd.)
Second year	maize/ millets and pulses (pigeon pea)	barley and peas/ pulses (pigeon pea) (contd.)
Third year	millets/ groundnut	peas and barley

The general rotations of crops prevalent in the clayey loam or the (BII) quality lands are:

	Kharif season	Rabi season
First year	Rice or maize	wheat and gram
Second year	Rice and millets	wheat and peas/ peas and gram
Third year	millets or millets mixed with pulses (pigeon pea) continued	peas and gram/ pulses (pigeon pea) (contd.)

It is noteworthy that there is an extra crop[1] which is sown after rabi crops' harvest, when desired. It consists of vegetables in cultivated lands and melons and water-melons in dry riverbeds. It is grown in the months of April to mid-June. The cultivation of vegetables improve soil fertility because the soil is intensively manured and irrigated.

The following practice is useful for recuperation of fertility of the soil which is indirectly related to the rotation of crops. The unbalanced-rotation of crops may reduce the fertility. The 57.27 per cent of the cropped land in the <u>kharif</u> season was under millets but 67.85 per cen of the <u>rabi</u> cropped land was under non-leguminous crops (reducing peas). Shortage of rainfall and less facilities of irrigation lead the cultivators to grow millets extensively which is quite unscientific and harmful to the soil. It is because millets followed by non-leguminous crops lower the nitrogen content of the soil.[2] However, the land under cereal crops, during a continuous number of years only, lowers the nitrogen content of the soil. This is one of the reasons why millets are generally sown mixed with '<u>arhar</u>' (pigeon pea), a leguminous crop, which continues to occupy the land in the rabi season also. The non-leguminous cereal crops of rabi season-preceded by only millets give very low yields.

Green manuring crop grown in the village is only sannhemp (Crotaloria juncea) in the kharif season, being only 3.36 per cent of the total cultivated land, of which a considerable quantity is harvested for hemp purposes, and its stems are used as fuel. Groundnut and sweet potatoes which occupy 11.1 per cent of the area in the kharif season are, in addition

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1. Locally known as '<u>Zaid</u>' crop.
2. Arakeri, H.R., Chalam, G.V. & Satyanarayana. — <u>Soil Management in India</u>, (Bombay, 1962), p.115.

good crops for green manuring. The green manuring during or after the kharif season enriches the soil with organic matter and nitrogen content which are very beneficial to the succeeding crops in the rabi season. The important leguminous crop sown during the rabi season is peas. It is generally grown mixed with other cereals. A large part of the crop during its growth is used as fodder. It covers 20.46 per cent of the total cultivated land or 31.35 per cent of the net sown area in rabi. It is grown mostly for grain and fodder: before ripening it is cut green for fodder while after the ripening its grain is obtained for food, and the rest of the plant is used as green manure.

Land Use and Population:

Total population of village Salempur is 457.[1] The total cultivated land and the per capita share in the lands under different types are given in the Table XXI.

The Table shows that the per capita total available land for cultivation is 0.835 acre, but owing to fallowing it is reduced to 0.674 acre in the kharif season. In the rabi season the per capita share is further reduced to 0.558 acre on account of (1) fallowing in the rabi season and (2) occupation of the land under continual kharif crops (17.01 per cent).

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1. During the course of land utilization survey in this village and in the following villages the writer noted also the occupations of the villagers together with the enumeration of the total population which includes all those persons who are dependent upon the produce of Salempur. They are locally called as 'ahars'. Three groups of population were formed: Primary rural, depending distinctively on agriculture; the secondary rural which serves the primary rural population through subsidiary services and industry; and adventitious population— the people employed in services outside the village but live in the village and share its produce. The persons living in other neighbouring villages but dependent upon the produce of land in this village have also been included in the population of the village concerned.

Table XXI

Total Population of Village Salempur ... 457
(Areas in acres)

	Total area of the village	Total cultivated land available[1]	Net cropped land in the kharif season.	Net cropped land in the rabi season.	Gross cultivated land (both of kharif and rabi)	Double cropped land[2]
	409.431	391.713	307.930	255.185	563.115	231.500
Land per head of population	0.896	0.835	0.674	0.558	1.232	0.507

The gross cultivated area,[3] however, gives a share of 1.232 acres per head of population. Actual amount of land which supported one person in the village Salempur is thus 1.232 acres. The double cropped land per head of population is merely 0.507 acre in the village.

Out of the total population, 93 per cent are cultivators or the primary rural in the village while 6 per cent are the secondary rural dependent upon the cultivating class; and only 1 per cent are adventitious persons, also depending on village produce.

CALORIC INTAKE

The yield[4] of different crops grown in the <u>kharif</u> and <u>rabi</u> seasons is given in the Table XXIIA. On the basis of yield of crops, the total production of different crops in the village has been calculated and an attempt has been made to assess the total caloric consumption per head per day in the village in Table XXIIB.

1. It includes 60.098 acres of land under annual fallowing.
2. Locally termed as '<u>dofasli bhumi</u>.'
3. Gross cultivated areais the sum total of both net-cropped area of the <u>kharif</u> and <u>rabi</u> seasons in this village.
4. The rate of yield of crops given here and in the following villages was communicated to the writer by the villagers in old weights of <u>maund</u> and <u>seer</u> during the course of the land use surveys in the <u>kharif</u> and <u>rabi</u> seasons, 1962-63. The rates have been converted into kilograms.

Table XIX

Total Cultivated land[1] ...., 391.713 acres

Net cropped land in the *kharif* season ...., 307.930 acres

Crops	Area in acres	Percentage to total cultivated land	Percentage to the net cropped land	Total percentage to the total cultivated land	Total percentage to the net cropped land
<u>Grain Crops</u>				58.46	74.42
Bulrush millet	112.531	28.72	36.54		
Bulrush millet and pulses(pigeon pea)	35.706	9.11	11.60		
Rice (broadcast)	23.135	5.90	7.51		
Rice (transplanted)	21.031	5.36	6.83		
Maize	8.650	2.21	2.81		
Bulrush millet and Sannhemp	7.250	1.85	2.35		
Bulrush millet and groundnut	6.781	1.73	2.20		
Bulrush millet and big millet	6.563	1.67	2.13		
Big millet	2.156	0.55	0.70		
Small millet	2.063	0.52	0.67		
Bulrush millet and sweet potatoes	1.938	0.49	0.63		
Bulrush millet and maize	1.375	0.35	0.45		
<u>Other crops</u>				20.16	25.58
Groundnut	34.469	8.85	11.20		
Sugarcane	30.938	7.90	10.05		
Fodder	6.969	1.78	2.26		
Sannhemp	5.906	1.51	1.92		
Vegetables	0.469	0.12	0.15		
Fallow	83.783	21.38	-	21.38	
Total	391.713	100.00	100.00	100.00	100.00

Table XXII A

Yield of Crops in Village Salempur, 1962-63

Crops	Yield per acre (in kilograms)
Bulrush millet (sown alone)	373
Bulrush millet (when sown with pulses)	190
Pulses (when sown with millets)	112
Rice (broadcast)	485
Rice (transplanted)	570
Maize	476
Bulrush millet and big millet (mixed)	373
Big millet	373
Small millet	187
Bulrush millet and maize (mixed)	424
Bulrush millet (sown with non-cereal crops)	190
Cane sugar (gur)[1]	1140
Wheat	485
Barley	490
Peas and gram[2] (mixed)	503
Wheat and gram (mixed)	489
Barley and gram (mixed)	485
Wheat and peas (mixed)	494
Barley and peas (mixed)	496
Wheat,barley and peas (mixed)	495
Barley,peas and gram (mixed)	498

1. The yield is that of unrefined sugar, known as '<u>gur</u>', and is manufactured from one acre of sugarcane.
2. Peas and/or gram are not generally sown alone.

Table XXII B

Food Balance Sheet

VILLAGE SALEMPUR

Population... 457 (in kilograms) Year 1962-63

Commodity	Production	Total Production	Export	Import	Available Supply	Seed	Food (Gross)	Extraction rate per cent	Food (net)	Per head Consumption Kilograms per year	Grams per day	Calories per day
Bulrush millet (sown alone)	42001.1											
Bulrush millet (sown with pulses)	6784.1	51819.3	35425.6	-	16393.7	582.5	15,811.2	95	15,020.6	32.868	90.0	313.2
Bulrush millet (sown with sannhemp, sweet potatoes or groundnut)	3034.1											
Bulrush millet and big millet	2447.9	2447.9	872.8	-	1575.1	24.6	1,550.5	95	1,472.9	3.223	8.8	30.4
Bulrush millet and maize	583.0	583.0	107.0	-	476.0	6.0	470.0	92	432.4	0.946	2.6	9.2
Rice (broadcast)	10620.5	10620.5	-	-	10620.5	485.5	10,135.0	66 2/3	6,756.7	14.785	40.5	144.6
Rice (transplanted)	11987.7	11987.7	3995.9	-	7991.8	147.7	7,844.1	66 2/3	5,229.4	11.443	31.4	112.7
Maize	4117.4	4117.4	-	-	4117.4	56.5	4,060.9	89	3,614.2	7.908	21.7	77.3
Big millet	804.2	804.2	289.5	-	514.7	7.4	507.3	95	481.9	1.054	2.9	9.9
Small millet	385.8	385.8	-	-	385.8	6.8	379.0	95	360.0	0.787	2.2	7.5
Pulses (sown with millets)	3999.1	3999.1	-	-	3999.1	89.0	3,910.1	95	3,714.6	8.129	22.3	76.5
Sugar (gur)	35269.3	35269.3	19398.0	-	15871.3	2886.3	12,985.0	-	12,985.0	28.414	77.8	273.1
Wheat	34904.9	34904.9	17452.4	-	17452.5	2303.0	15,149.5	90	13,634.6	29.813	81.7	272.9
Wheat - gram	18352.8	18352.8	9176.4	-	9176.4	1710.8	7,265.6	92	6,684.4	16.627	45.5	157.4
Wheat - barley	21154.3	21154.3	10577.1	-	10577.2	1390.0	9,187.1	80	7,349.7	16.083	44.1	146.9
Barley - peas	20878.6	20878.6	4175.7	-	16702.9	1431.2	15,271.7	82	12,522.8	27.402	75.1	254.6
Peas - gram	8362.4	8362.4	-	-	8362.4	573.6	7,788.8	95	7,399.4	16.191	44.4	156.3
Wheat - barley - peas	5769.7	5769.7	-	-	5769.7	384.7	5,385.0	85	4,577.2	10.016	27.4	92.4
Barley- peas - gram	2552.5	2552.5	-	-	2552.5	172.5	2,380.0	86 2/3	2,062.7	4.514	12.4	42.8
Barley - gram	2182.5	2182.5	-	-	2182.5	148.5	2,034.0	82	1,667.9	3.649	9.9	34.2
Wheat - peas	1321.4	1321.4	-	-	1321.4	86.9	1,234.5	92	1,135.7	2.485	6.8	23.1
Wheat - gram- peas	1010.2	1010.2	-	-	1010.2	68.2	942.0	93	876.1	1.917	5.3	18.3
Barley	612.5	612.5	-	-	612.5	40.0	572.5	70	400.8	0.877	2.4	7.9
Total												2,261.2

. The yield in A quality lands is quite good while in BI and BII is medium. The good yield, in addition to large cultivated land available, has resulted in increased output of crops in the village. The village is undoubtedly self-sufficient with respect to its quantitative consumption. Moreover, the village exports some quantity of its produce to other markets as Bisauli town, etc. to meet the other needs of the villagers.

It will be seen from Table XXIIB that, with an intake of 2261 calories per head per day, the villagers are well-placed in consuming foodstuffs as compared to the villages of other soil types. The large intake of calories is from bulrush millet which has much deficient amount of fat and carbohydrates and a moderate deficiency of protein. The deficiency of carbohydrate is made up by the large carbohydrate content in '<u>gur</u>' which is an important item in the diet of villagers and constitutes the second largest source of calories, yet the deficiency of fat, in addition to deficiencies of vitamins C,D and A, still exists. Hence the diseases of these nutritional deficiencies prevail in the village.

POTENTIAL PRODUCTION UNIT

On the basis of the yield of crops in the village, the writer has attempted to evaluate the potential productivity of different types of agricultural lands in the village. Table XXIII gives the relative ratings of different types of cultivated lands and total numbers of Potential Production Units which are calculated for each of them.

Table XXIII

Average Yield per acre of normal Standard Farmland in the Village : 487 kilograms or 1 P.P.U.

Type of land		Area in acres	Average yield in kilograms	Productivity rating per acre	Number of P.P.U.
Good quality land (A)		262.438	591	1.21	317.549
Medium quality lands	BI	12.219	487	1.00	12.219
	BII	117.056	440	0.90	105.350
Total		391.713			435.118

It will be seen from the above Table that the Potential Production Units in the village lands are considerably high in respect of its total culturable acreage. It is evident that there is no C class or unproductive land in the village. The good quality land (A) which is equal to 1.21 P.P.U. per acre, covers the largest area in the village, with the result that its contribution towards the total number of P.P.U. is very large. The BI land which consists of comparatively small area is equal to 1 P.P.U. per acre; while there is a slight difference of productivity rating per acre between BI and BII lands. It is remarkable that the second largest area in the village is of BII quality land which is equal to 0.90 P.P.U. per acre. If, however, the facilities for irrigation and manuring are sufficiently extended to the BI lands, the productive value of the area may well be raised to the value of A quality lands; in the same way the productive value of the large area of BII class may be increased to BI standard through the application of manures and irrigation, particularly because the BII lands consist of sandy loam soil.

The inadequacy of irrigation facilities has played a considerable role in lessening the average yield of different quality lands which can be well increased with the help of irrigation.

LAND UTILIZATION IN MULLANPUR

LOCATION

The village Mullanpur[1] is situated in the Budaun Tahsil at 28°7'50"N. lat. and 79°18'30"E. long. in the well-drained level plain. It is bounded by the villages of Tisga in the west, Bilhat in the southwest, Faridpur in the north, Nausana in the southeast, and Kishorpur in the northeast (Fig.49). A small seasonal stream, Bajha, flowing from northwest to southeast makes half the boundary of Mullanpur and Kishorpur. This stream is the only outlet to the rain water of the area.

The village is accessible only by cart-tracks which connect the village with other surrounding villages. The communication between Mullanpur and Kishorpur and other northeastern villages of pargana Salempur, Tahsil Dataganj, is suspended during the wet monsoon months due to full flow of Bajha stream, but during the dry months the route remains open.

Remoteness of the Budaun city and the difficult communications are responsible for poor facilties of marketing resulting in comparatively poor economy of the village.

CLIMATE

No climatic data are recorded in the village. The data of rainfall recorded at Budaun Tahsil headquarters, given in Tables XXIV and XXV, may be taken as close approximation of the rainfall conditions of the area for an assessment of its influence on the cropland use in the village.

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1. The village is also known as Mullanpur Mutaalleqa Faridpur Nausana.

LOCATION OF THE VILLAGE MULLANPUR

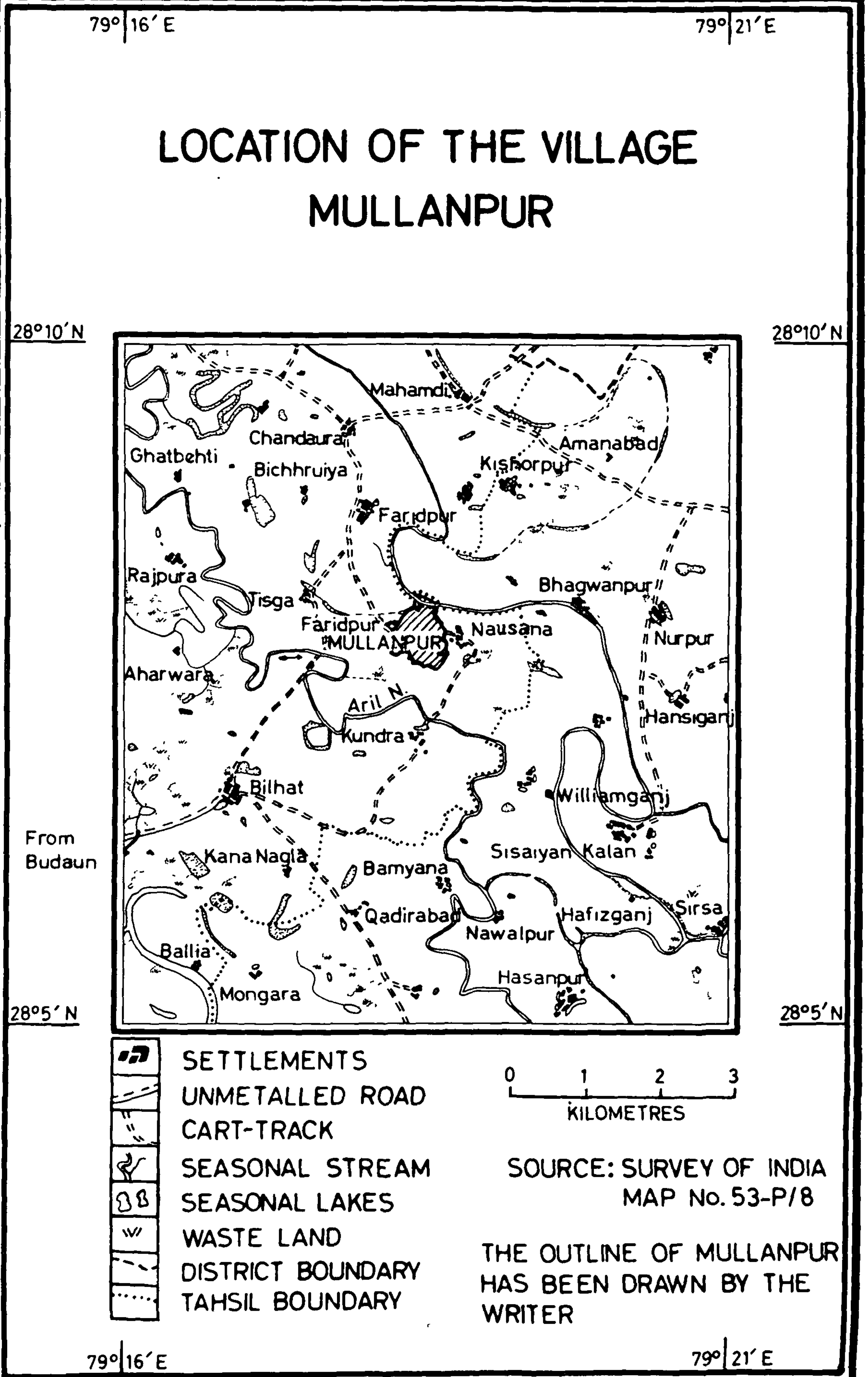

FIG. 49

Table XXIV

Rainfall in the Kharif Season,1962 (Budaun)

	MONTHS					
	June	July	Aug.	Sept.	Oct.	Total
Rainfall in millimetres in the kharif season, 1962.	51.5	232.6	377.0	227.0	-	888.1
Rainy days in the kharif season,1962	3	9	10	6	-	
Average rainfall in millimetres	78.4	267.4	241.0	162.4	50.8	799.9

The rainfall in June and July was below average but was above the average in the next two months of the season. The total rainfall of the season was, however, sufficient for kharif crops.

Table XXV

Rainfall in the Rabi Season, 1962-63 (Budaun)

	MONTHS					
	Nov.	Dec.	Jan.	Feb.	March	Total
Rainfall in millimetres in the rabi season,1962-63	-	-	21.1	-	8.9	30.0
Rainy days in the rabi 1962-63	-	-	1	-	2	
Average rainfall in millimetres	2.3	8.4	19.7	18.9	13.4	62.8

There was no rainfall in November and December. But in January the rainfall was slightly above the monthly average. February experienced rainless conditions, while March received less amount of rainfall than the average. The total seasonal rainfall was less than half of the seasonal average and the dry conditions, therefore, affected the rabi crops.

LAND CLASSIFICATION

On the basis of the fertility and productivity, the fields of the village have been classified into A,BI,BII,C quality lands (Fig.50). The area of the soil of good quality lands (A) is 84.375 acres, or 46.75 per cent of the total cultivated land of the village. It is well-drained level plain irrigated by the stream and wells. The land is cropped twice in the year i.e., in both kharif and rabi seasons. A part of this type of land is also devoted to the cultivation of sugarcane which is a high yielding crop. The soil around the settlement is the best loam, locally termed as '<u>gouhan</u>.'

The medium quality lands, which are less productive than A lands, are sub-divided into BI and BII classes. The medium quality lands are cropped in one season and are left fallow for one or two seasons. The BI lands are texturally sandy loam. They occupy the second largest area in the village . The BII lands which are clayey loam in texture occupy smaller area, these have greater capacity to retain moisture than other soils. They are usually devoted to cultivation of rice - both transplanted and broadcast and gram sown alone or mixed with other cereals. A small area of 1.5 per cent of the village is waste land (C), consisting of usar, swar[1] and eroded land.[2]

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1. The usar land which has small amount of salt is known as 'swar'.
2. The bad land due to soil erosion is locally called 'kharra.'

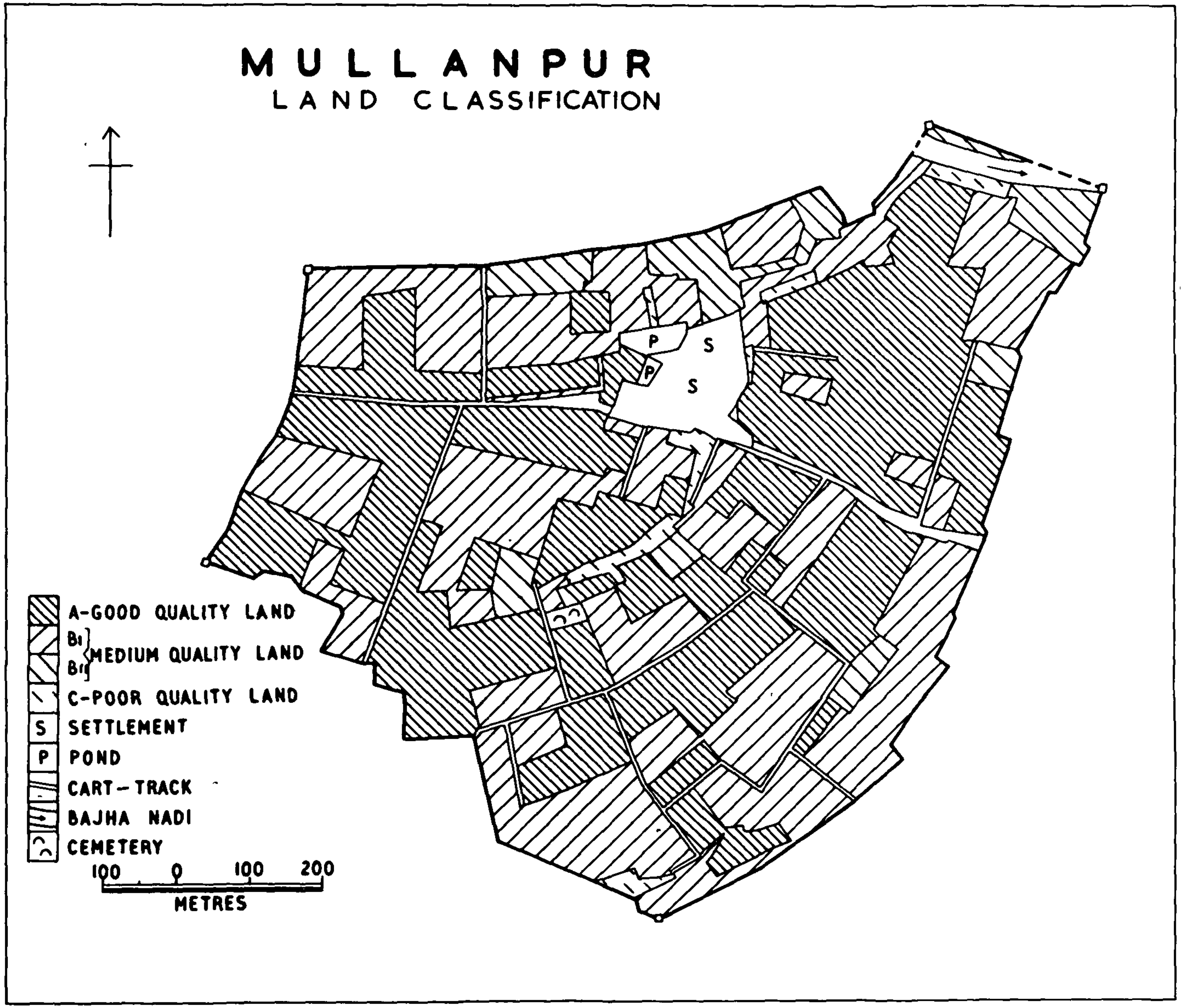
MULLANPUR
LAND CLASSIFICATION
A-GOOD QUALITY LAND
B1
B11
MEDIUM QUALITY LAND
C-POOR QUALITY LAND
S SETTLEMENT
P POND
CART-TRACK
BAJHA NADI
CEMETERY
100 0 100 200
METRES
P
P
S
S

FIG. 50

IRRIGATION

The irrigated and unirrigated lands have been shown in Fig.51. The shortage of rainfall in the rabi season (see Table XXV) necessitated irrigation for crops with the result that the area irrigated in rabi season is greater than the area irrigated in the kharif season.

The Bajha stream, ponds and wells are the main sources of irrigation. The rainfall in the kharif season was adequate for kharif crops but sugarcane was irrigated owing to its greater water requirements.

In the rabi season, wheat, gram and vegetables are generally irrigated while barley, peas and mixed crops are occasionally irrigated. Only a few masonry wells are provided with the Persian wheels. The non-masonry wells are often dug temporarily for irrigation. About 0.6 acre of land is irrigated in a day from either a well, pond or the stream, which generally costs rupees six per day and rupees four per night. Butthe cost of irrigation to sugarcane is nearly double as compared to other crops owing to its greater requirements of water.

LAND UTILIZATION

Fig.52 shows the cultivated fields and also lands under other uses in the year 1962-63. Table XXVI gives the area and percentage to the total area-occupied by each type of land use in the village.

The Table shows that 91.02 per cent of the total village area is cultivated land while the rest 8.08 per cent is under nine different uses. There are no groves or jungles to supply fuel to the village. Therefore to prepare and burn the dung-cakes is a general practice in the village. Most of the fields are generally rectangular in shape which, after consolidation of holdings in 1961 have been divided into large size. However the cultivators sub-divide them to be devoted to many crops in one season.

1. The small sub-divisions of fields are locally called ' Kiraiya.'

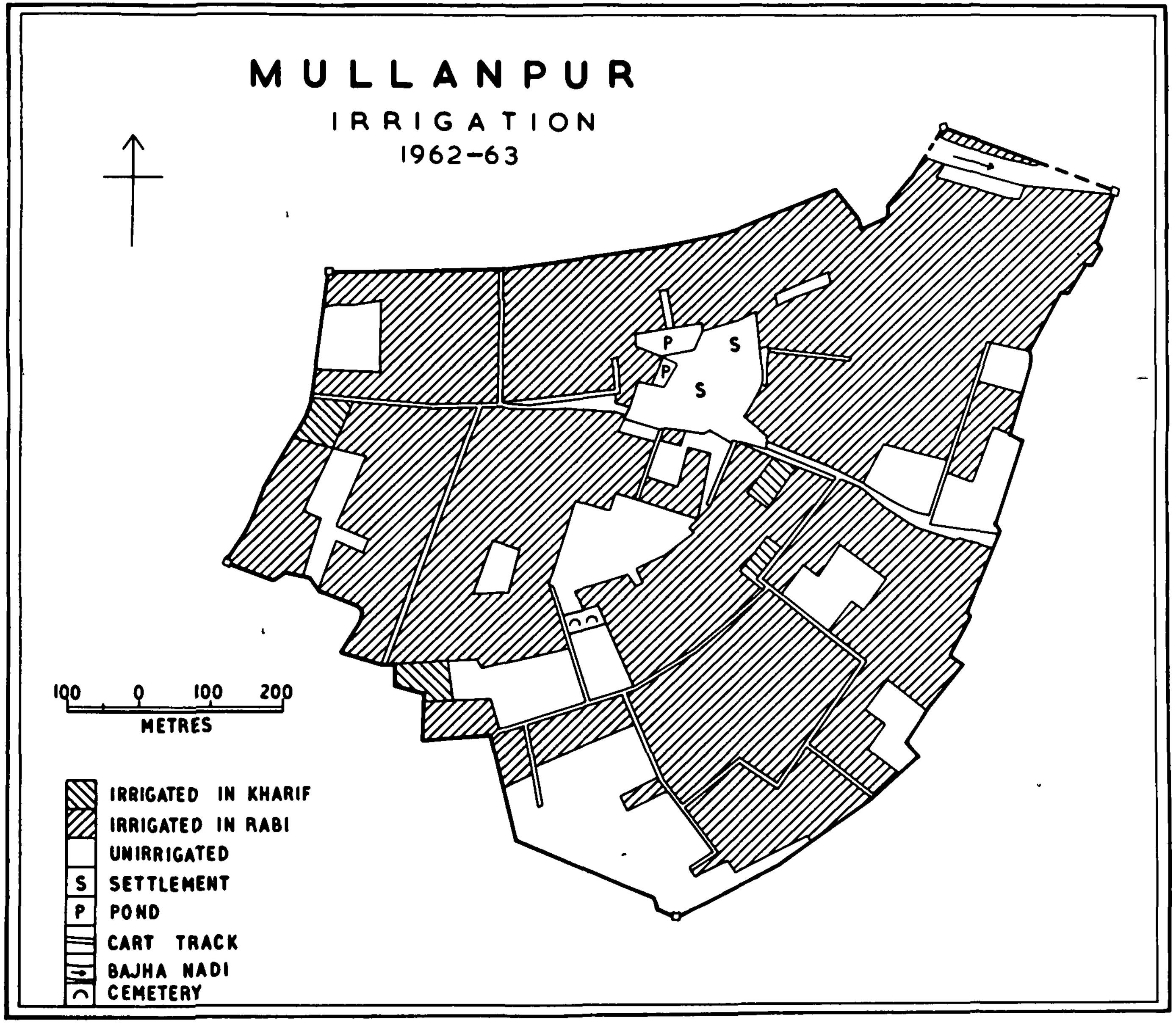
MULLANPUR
IRRIGATION
1962–63
S
P
100 0 100 200
METRES
IRRIGATED IN KHARIF
IRRIGATED IN RABI
UNIRRIGATED
SETTLEMENT
POND
CART TRACK
BAJHA NADI
CEMETERY

FIG. 51

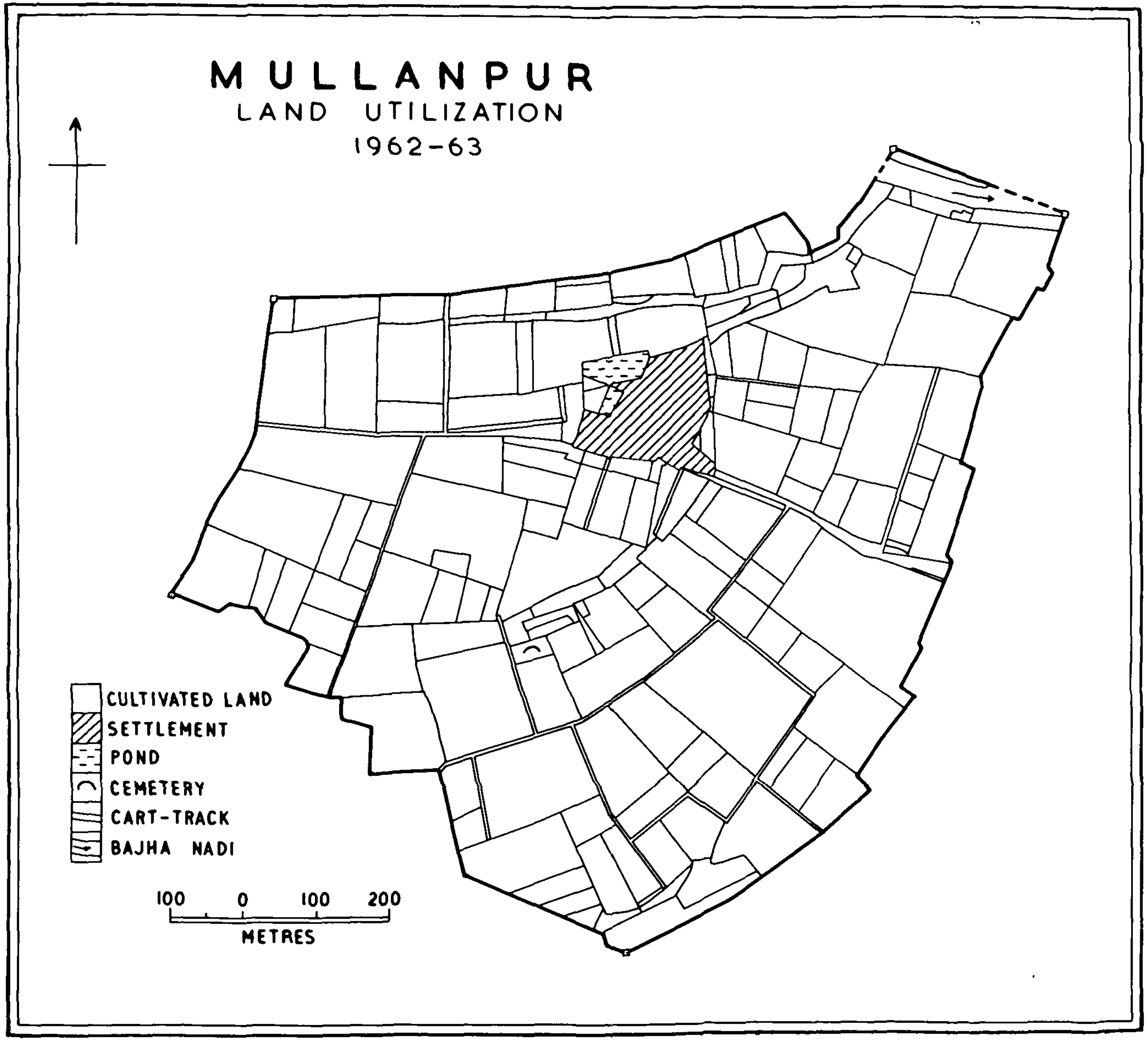
MULLANPUR
LAND UTILIZATION
1962-63
CULTIVATED LAND
SETTLEMENT
POND
CEMETERY
CART-TRACK
BAJHA NADI
100 0 100 200
METRES

FIG. 52

Table XXVI

Total area of the Village .. 198.281 acres

Use of Land	Area in acres	Percentage to the total area
Cultivated land	180.475	91.02
Waste land	2.968	1.50
Meadow[1]	0.770	0.39
Thatching grass[2]	0.594	0.30
Settlement	6.254	3.15
Cart-track and irrigation channel	4.695	2.37
Cemetery and crematory	0.753	0.38
Seasonal stream	0.500	0.25
Pond	0.906	0.46
Manure Pits	0.366	0.18
Total	198.281	100.00

The pattern of such sub-divisions changes from season to season.

LAND UTILIZATION IN KHARIF SEASON

Fig.53 shows the distribution of crops and other occupation of land in the kharif season,1962. Table XXVII gives a summary of the area occuped by each crop and its percetages to the total cultivated land and to the net cropped land.

---

1. Locally called '<u>Pashuchar bhumi</u>.'
2. The land occupied by thatching grass is locally known as '<u>Bhara</u>.'

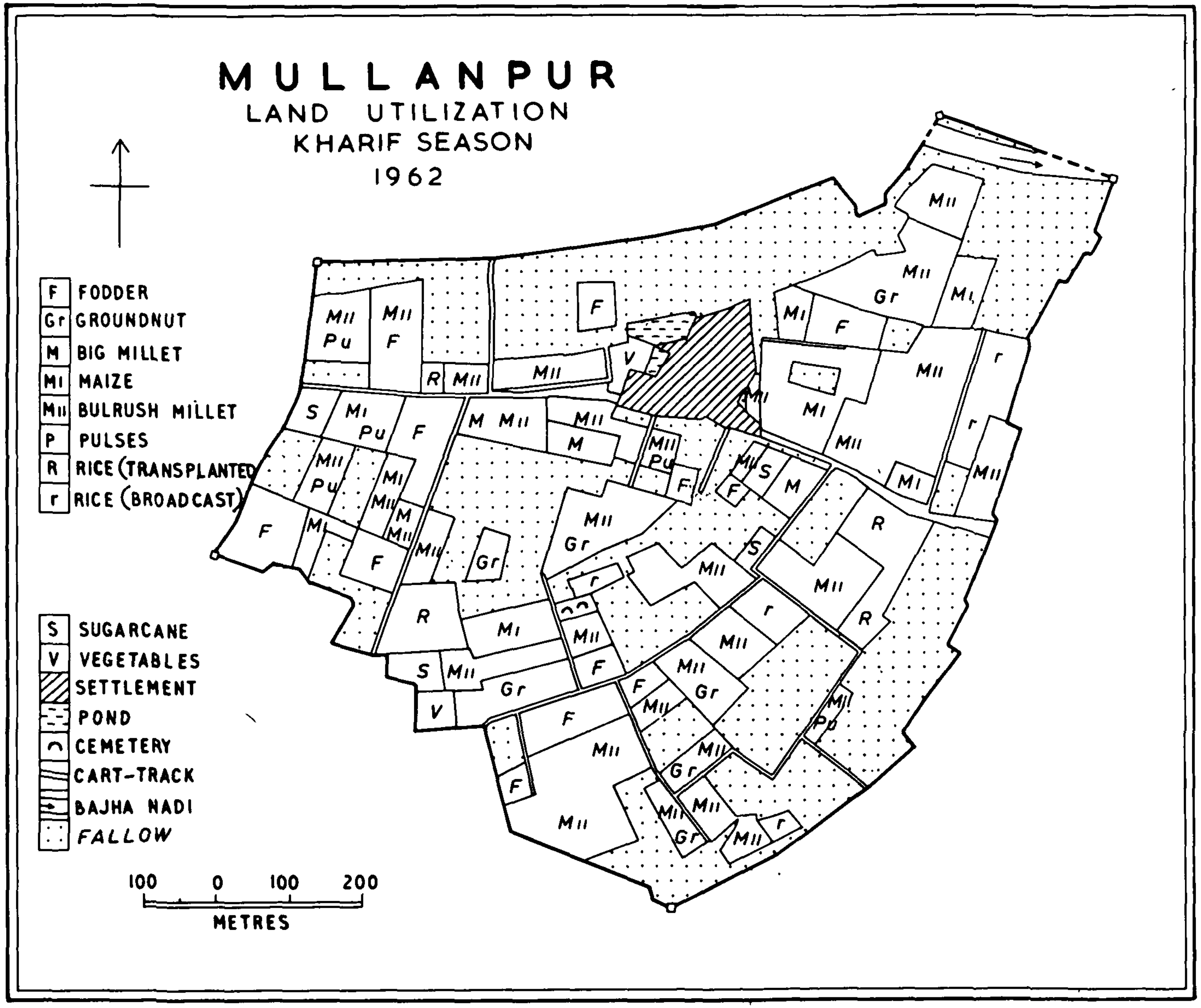
MULLANPUR
LAND UTILIZATION
KHARIF SEASON
1962
F FODDER
Gr GROUNDNUT
M BIG MILLET
MI MAIZE
MII BULRUSH MILLET
P PULSES
R RICE (TRANSPLANTED)
r RICE (BROADCAST)
S SUGARCANE
V VEGETABLES
SETTLEMENT
POND
CEMETERY
CART-TRACK
BAJHA NADI
FALLOW
100 0 100 200
METRES

FIG. 53

Table XXVII

Cultivated Land ... 180.475 acres

Net Cropped Land in the Kharif Season ... 87.006 acres

Crops	Area in acres	Percentage to total cultivated land	Percentage to net cropped land	Total percentage to the total cultivated land	Total percentage to the net cropped land
Grain Crops				41.50	68.08
Bulrush millet	35.625	19.74	40.95		
Bulrush millet and groundnut	11.719	6.49	13.47		
Maize	8.656	4.80	9.95		
Rice (transplanted)	5.938	3.29	6.82		
Rice (broad-cast)	3.688	2.04	4.24		
Bulrush millet and pulses (pigeon pea)	3.750	2.08	4.31		
Big millet and bulrush millet	2.656	1.47	3.05		
Big millet	1.438	0.80	1.65		
Maize and bulrush millet	1.055	0.58	1.21		
Bulrush millet and fodder	0.375	0.21	0.43		
Other Crops				6.70	13.92
Fodder	7.609	4.22	8.75		
Groundnut	2.309	1.28	2.65		
Sugarcane	1.344	0.74	1.55		
Vegetables	0.844	0.46	0.97		
Fallow	93.469	51.80		51.80	
Total ...	180.475	100.00	100.00	100.00	100.00

It is evident from the Table that 41.5 per cent of the total cultivated land in the kharif season is under grain crops, 6.7 per cent is under non-cereal crops, while the largest area or 51.8 per cent is left fallow. It is remarkable that 86.08 per cent of the net cropped land in the kharif season is occupied by the cereal crops and only 13.92 per cent is under other crops. Bulrush millet is the main kharif crop, occupying 40.95 per cent of net cropped area in the season. Besides being grown as a sole crop, bulrush millet is also grown mixed with groundnut, pulses (pigeon pea), big millet, maize and fodder. The largest acreage under bulrush millet is because it is well-suited to deficient or less rainfall in the season. Nevertheless, this crop in the year 1962 suffered to some extent owing to excessive rainfall in September. Yet average crop conditions in the season remained sufficiently good. Groundnut mixed with bulrush millet occupying 13 per cent of the net cropped area is the second important crop while the crop of rice[1] occupying about 11 per cent of the net cropped area in the season is the third important crop. The crop of maize with 10 per cent of the net cropped area is the fourth in importance.

Sugarcane, due to its greater needs of waterings, could occupy only 1.55 per cent of the net cropped area. Vegetables are grown in a very small area in the season.

Owing to lack of fertility in the soil, about half of the cultivated area of the village was left fallow to recuperate its fertility. With this type of seasonal fallowing the land becomes capable of being cropped in the subsequent rabi season.

---

1. The land special for rice crop is locally known as '<u>jhabra</u>'

LAND UTILIZATION IN THE RABI SEASON

The distribution of crops in the rabi season of 1962-63 and other uses of land are depicted in Fig.54. A summary of the area under each crop and its percentages to the total cultivated land and to the net cropped land are given in Table XXVIII.

The Table shows that the area sown in the rabi season is nearly double than that of the kharif sown area. The area under fallow and the continual kharif crops is very small. More than 95 per cent of the total cultivated land in the village has been sown in the rabi season. The greatest proportion of net cropped land in rabi, 94.16 per cent, was under cereal crops. Wheat has been the biggest crop of the village, occupying 40.17 per cent of the total cultivated land. Wheat mixed with other cereals, barley, gram and peas, occupies the second largest area of the cultivated land. Gram, alone or mixed with other grain crop, is generally sown in the clayey loam, as its crop flourishes well in the cloddy soil.[1] Gram, peas and barley, particularly the former two, are generally sown mixed with other cereals, and occupy 44.97 per cent of the net cropped land in the rabi season. Besides it, gram has also been sown between plants of continual kharif pulses (pigeon pea).

In the non-cereal crops of rabi season, vegetables, occupying 2.59 per cent of the net cropped land, is the biggest crop. A considerable proportion of the cropped area has also been occupied by fodder and potato crops. Continual kharif crops include 'arhar' (pigeon pea) and sugarcane.

---

1. The local adage explains it as '*jab sail khana khan baje, tab chana khub hi saje*' meaning: when the clods of soil are hard, the crop of gram flourishes well.

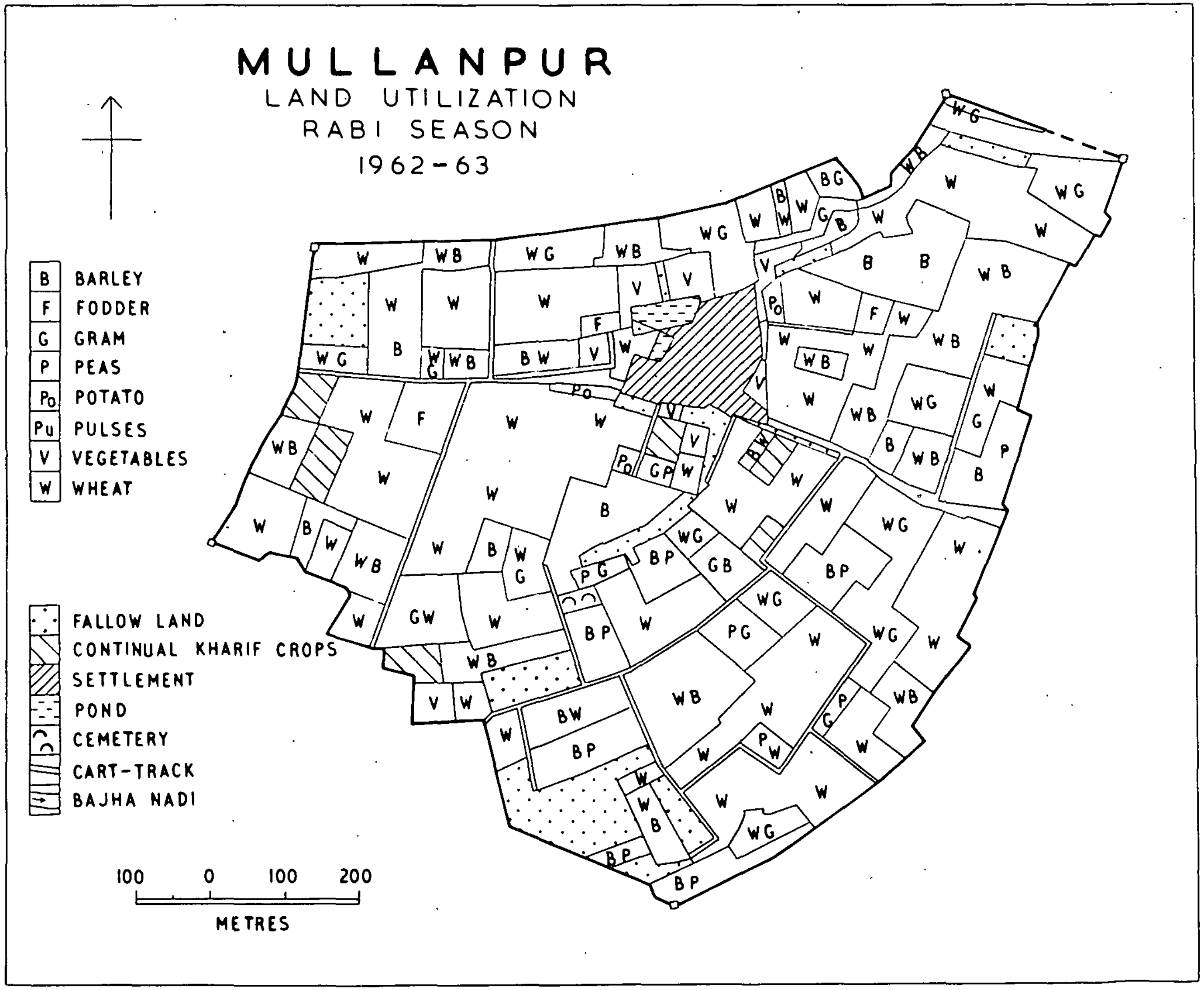
MULLANPUR
LAND UTILIZATION
RABI SEASON
1962-63
B BARLEY
F FODDER
G GRAM
P PEAS
Po POTATO
Pu PULSES
V VEGETABLES
W WHEAT
FALLOW LAND
CONTINUAL KHARIF CROPS
SETTLEMENT
POND
CEMETERY
CART-TRACK
BAJHA NADI
100 0 100 200
METRES

FIG. 54

Table XXVIII

Cultivated Land... 180.475 acres

Net Cropped Land in the Rabi Season ... 172.756 acres

Crops	Area in acres	Percentage to the total cultivated land	percen-tage to net cropped land	Total percentage to total cultivated land	Total per-centage to net cropped land
Grain Crops				90.13	94.16
Wheat	72.501	40.17	41.97		
Wheat - barley	33.874	18.77	19.61		
Wheat - gram	26.590	14.73	15.39		
Barley - peas	11.375	6.30	6.58		
Barley	9.313	5.16	5.39		
Peas - gram	2.500	1.38	1.45		
Gram	1.812	1.00	1.05		
Barley - gram	1.250	0.70	0.72		
Barley - wheat-peas	1.246	0.69	0.72		
Gram in the conti-nual kharif pulses	0.938	0.52	0.54		
Peas - wheat	0.469	0.26	0.27		
Peas	0.410	0.23	0.24		
Wheat -gram- peas	0.398	0.22	0.23		
Other Crops				5.59	5.84
Vegetables	4.469	2.48	2.59		
Fodder	3.000	1.66	1.74		
Potato	2.611	1.45	1.51		
Continual kharif crops	4.156	2.31		2.31	
Fallow	3.563	1.97		1.97	
Total ...	180.475	100.00	100.00	100.00	100.00

DOUBLE CROPPED LAND

Fig.55 depicts the area which is cropped twice in the year 1962-63 in the kharif as well as in rabi season. The double cropped area is 83.031 acres which is 46 per cent of the total cultivated land of the village. All the land cropped twice in the year possesses good quality (A) soil. Nevertheless, the area under double cropping is not static, as it can well be increased through improvement in fertility by sufficient and regular manuring and irrigation.

The gross cultivated land(total of kharif and rabi) amounts to be 259.762 acres which includes 83.031 acres of the double cropped land.

ROTATION OF CROPS

Certain rotations of crops are adopted according to the characteristics of the land, climatic provisions or lacking, in the light of presence or absence of facilities for irrigation and manuring. There are no hard and fast rules for rotation. They may differ from those in other villages. But generally they are the same. The lands of best agricultural qualities (A) are usefully cropped in successive seasons for years continuously. The choice of crop depends on the farmers' needs also. The general practice of crop rotations is as in the previous village.

The residue of groundnut crop after harvest is applied as green manure to the land after which crops of peas and wheat are grown well in the rabi season. Sowing wheat after maize, and gram —— alone or mixed with wheat or peas —— after rice crop is a usual practice.

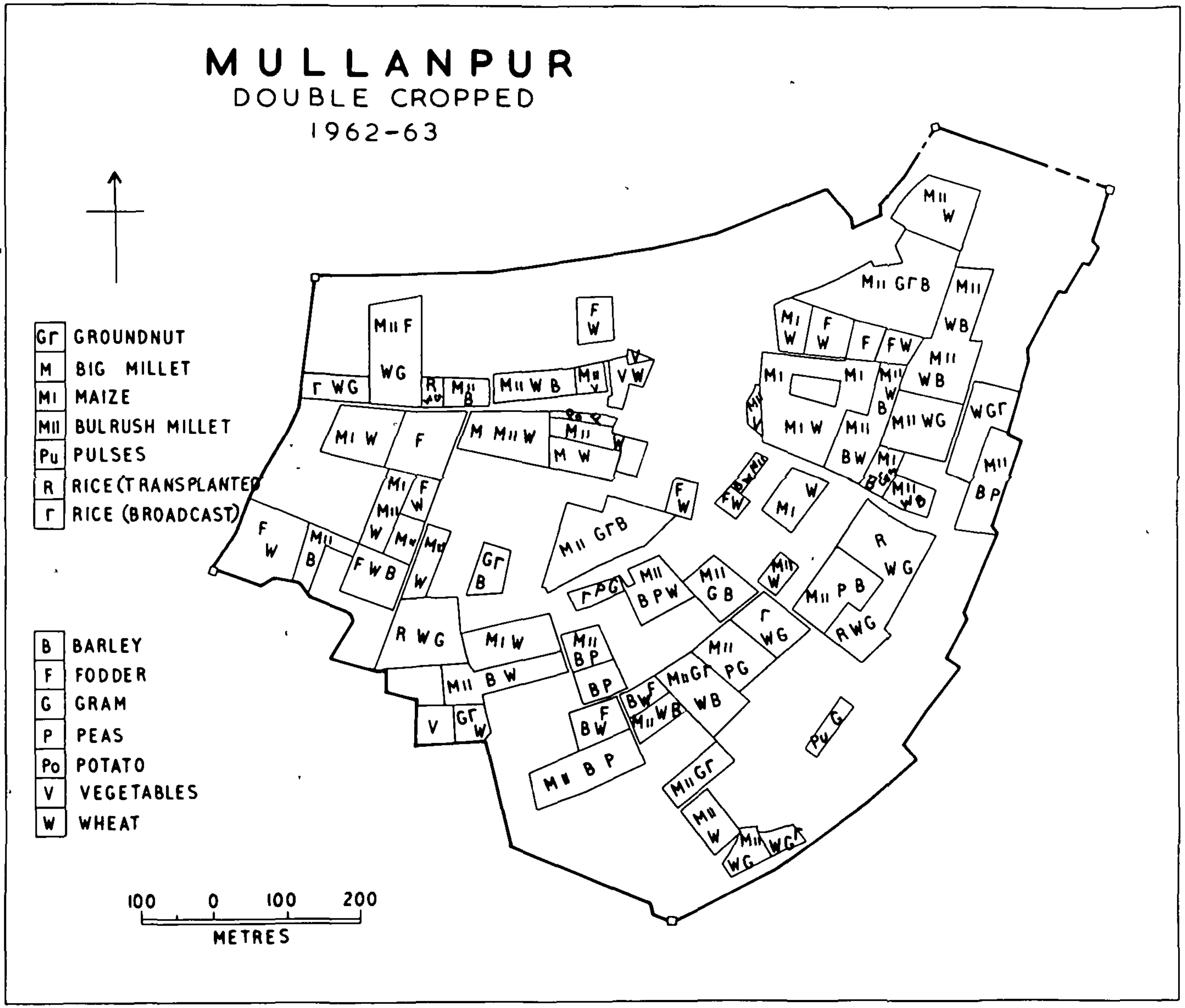
MULLANPUR
DOUBLE CROPPED
1962-63
Gr GROUNDNUT
M BIG MILLET
MI MAIZE
MII BULRUSH MILLET
Pu PULSES
R RICE (TRANSPLANTED)
r RICE (BROADCAST)
B BARLEY
F FODDER
G GRAM
P PEAS
Po POTATO
V VEGETABLES
W WHEAT
100 0 100 200
METRES

FIG.55

LAND USE AND POPULATION

The total population of the village is 332. The total cultivated land and the per capita share in the lands under different items is given in Table XXIX.

Table XXIX

Total Population of Village Mullanpur.... 332
(Areas in acres)

	Total area of the village	Total cultivated land 1 available	Net cropped land in the kharif season	Net cropped land in the rabi season	Gross cultivated land (both of kharif and rabi)	Double cropped land
	198.281	180.475	087.006	172.756	259.762	83.031
Land per head of population	0.597	0.544	0.262	0.520	0.782	0.250

The above Table shows that the per capita total cultivated land is 0.544 acre, and owing to large fallowing in the kharif season it is reduced to 0.262 acre, which increases to 0.520 acre in the rabi season. The gross cultivated area of both kharif and rabi seasons per head of population amounts to be 0.782 acre. The actual amount of land which supported one person in the village Mullanpur is thus 0.782 acre. The land which is cropped twice in the crop year amounts to be only 0.25 acre per head of population.

---

1. It includes 3.744 acres of land which remained under fallowing for both kharif and rabi seasons, 1962-63.

Out of the total population, 96 per cent are primary rural or farmers while the rest are secondary rural which are dependent upon the cultivating class.

CALORIC INTAKE

Table XXX A gives the yield of different crops grown in the kharif and the rabi seasons in the village. On the basis of the yield of crops, the total production of different crops in the village has been computed by the writer and the total caloric consumption per head per day has also been calculated in Table XXX B.

Table XXX A

Crops	Yield per acre (in kilograms)
Bulrush millet (sown alone)	336
Maize	467
Rice (transplanted) unhusked	548
Rice (broadcast) unhusked	480
Bulrush millet (sown with non- cereal crops)	168
Bulrush millet sown with pulses (pigeon pea)	187
Pulses (sown with millets)	112
Big millet and bulrush millet	354
Big millet (sown alone)	336
Cane sugar (gur)[1]	1,100
Wheat	470
Barley	450
Gram	411
Peas	560
Gram (when sown in the continual kharif pulses)	150
Potatoes	1,866

1. The locally manufactured unrefined sugar is called '<u>gur</u>'; its yield is from an acre of sugarcane.

Table XXX B

FOOD BALANCE SHEET

VILLAGE MULLANPUR

(in kilograms)

Population ... 332 Year 1962-63

Commodity	Production	Total Production	Export	Import	Available Supply	Seed	Food (Gross)	Extraction rate per cent	Food (net)	Per head Consumption: Kilograms per year	Grams per day	Calories per day
Bulrush millet	13288.1											
Bulrush millet (sown with pulses)	701.3	16021.2	7208.6	-	8812.6	216.6	8596.0	95	8166.2	24.597	67.4	234.6
Bulrush millet (sown with non-cereal crops)	2031.8											
Bulrush millet and Big millet	940.2	940.2	470.1	-	470.1	12.1	458.0	95	435.1	1.311	3.6	12.4
Big millet	483.2	483.2	149.0	-	334.2	6.7	327.5	95	311.1	0.937	2.6	8.9
Bulrush millet and maize	423.0	423.0	42.3	-	380.7	5.9	374.8	92	344.8	1.038	2.8	9.9
Pulses (sown with millets)	420.0	420.0	-	-	420.0	5.6	414.4	95	393.7	1.186	3.2	10.9
Maize	4042.4	4042.4	-	-	4042.4	56.4	3986.0	89	3547.5	10.685	29.3	104.3
Rice (transplanted)	3254.0	3254.0	-	-	3254.0	55.4	3198.6	66 2/3	2132.4	6.423	17.6	63.2
Rice (broadcast)	1770.2	1770.2	-	-	1770.2	103.2	1667.0	66 2/3	1111.3	3.347	9.2	32.8
Sugar (gur)	1478.4	1478.4	-	-	1478.4	125.4	1353.0	--	1353.0	4.076	11.2	39.3
Wheat	34075.5	34075.5	-	-	34075.5	2452.9	31622.6	90	28460.3	85.724	237.6	793.6
Wheat-barley	15209.9	15209.9	-	-	15209.9	1117.9	14092.0	80	11273.6	33.957	93.0	309.7
Wheat-gram	11433.7	11433.7	-	-	11433.7	904.1	10529.6	92	9687.2	29.178	79.9	276.5
Barley	4190.9	4190.9	-	-	4190.9	307.3	3883.6	70	2718.5	8.188	22.4	74.4
Barley-peas	5744.4	5744.4	-	-	5744.4	386.7	5357.7	82	4393.3	13.233	36.3	123.1
Peas-gram	1212.5	1212.5	-	-	1212.5	90.0	1122.5	95	1066.4	3.212	8.8	30.9
Barley-gram	537.5	537.5	-	-	537.5	42.5	495.0	82	404.9	1.219	3.3	11.4
Barley-peas-wheat	604.3	604.3	-	-	604.3	41.9	562.4	85	478.0	1.439	3.9	13.2
Gram	744.7											
Gram (sown in the continual kharif crop)	140.7	885.4	-	-	885.4	59.2	826.2	95	784.9	2.364	6.5	23.3
Peas	229.6	229.6	-	-	229.6	14.8	214.8	95	204.0	0.615	1.7	5.9
Peas-wheat	236.4	236.4	-	-	236.4	15.9	220.5	92	202.9	0.611	1.7	5.8
Wheat-gram-peas	187.9	187.9	-	-	187.9	13.5	174.4	93	162.2	0.489	1.3	4.5
Potato	4872.1	4872.1	-	1267.1	6139.2	433.4	5705.8	85	4849.9	14.608	40.0	28.0
Total												2216.6

The yields of crops per acre in different types of land differ considerably. The A quality lands have sufficiently higher productive efficiency than BI or BII lands, of medium quality. Occupying the largest cultivated area of 46.75 per cent of total cultivated land, the A quality land yields best crops. The village is undoubtedly self-sufficient with respect to its consumption. The village, moreover, exports a part of its produce to meet other needs of the farmers.

Table XXX B shows that with an intake of 2,217 calories per head per day, the foodstuffs suffice their diets unlike the villages of other soil types.

The greatest caloric intake is from wheat, wheat-barley and wheat-gram while bulrush millet ranks fourth, and barley-peas fifth in calorific supply to the village population.

POTENTIAL PRODUCTION UNIT

The different types of agricultural lands in the village have been evaluated by the writer to assess their potential productivity on the basis of varying yields of crops. The relative ratings of different types of cultivated lands and total numbers of Potential Production Units, calculated for each of them, are given in the Table XXXI.

The Table shows that the Potential Production Units are fairly high as against the total cultivated land. The good quality land (A) which covers the largest proportion of the cultivated land, is equal to 1.33 P.P.U. per acre, resulting in its very large contribution to the total number of P.P.U. The BI quality lands possess the normal standard productivity and are thus equal to 1 P.P.U. per acre. The lands with the category BII are slightly inferior to the normal standard farmland and are equal to 0.98 P.P.U. per acre.

Table XXXI

Average Yield per acre of Normal Standard Farmland in the Village: 463 kilograms or 1 P.P.U.

Type of land	Area in acres	Average yield in kilograms per acre	Productivity rating per acre	Number of P.P.U.
A	84.375	614	1.33	112.219
BI	79.284	463	1.00	79.287
BII	16.813	454	0.98	16.477
C	2.968	0	0	0
Total	183.443			207.983

The C quality land has no production and hence no P.P.U.

If, however, the facilities of manuring and fertilizers and the irrigation are sufficiently extended to the BI lands, a good proportion of them may well be turned into A quality land. In the same way, the productivity rating per acre of BII lands may be raised to that of BI lands.

Inadequate supply of manures and absence or deficiency of irrigation facilities lower the productive value of the land considerably. A considerable proportion of these lands suffer from both of these deficiencies.

LAND UTILIZATION IN ASDHARMAI

LOCATION

The village Asdharmai of Datagani Tahsil is situated at 79° 20' 30" E.long. and 27° 51' 10" N.lat. The village is situated in a level plain consisting of fertile loamy soil. It is 17.6 km. south of Dataganj, 6.5 km. east of the village Miaon, and 4.8 km. southeast of village Gauntara. It is bounded by the villages Bhuripatti in the west, Gora Barela and Ninimai in the east, Nabiganj in the north and Milkia and Hazara in the south (Fig. 56). The site of the settlement is in the northwest of the village. There is no river in the vicinity of the village. The River Ramganga flows at about 9.6 km. to the northeast of the village.

The village is not easily accessible. The cart-tracks to Nabiganj, Hazara and Raipura are difficult to be used in the rainy season. The means of communication and transportation to Dataganj are also difficul particularly in the rainy season.

CLIMATE

No climatic data are recorded in the village. The rainfall data, however, recorded at the Dataganj Tahsil headquarters may be considered as applicable for rainfall conditions of the village area. The data is given in the Tables XXXII and XXXIII.

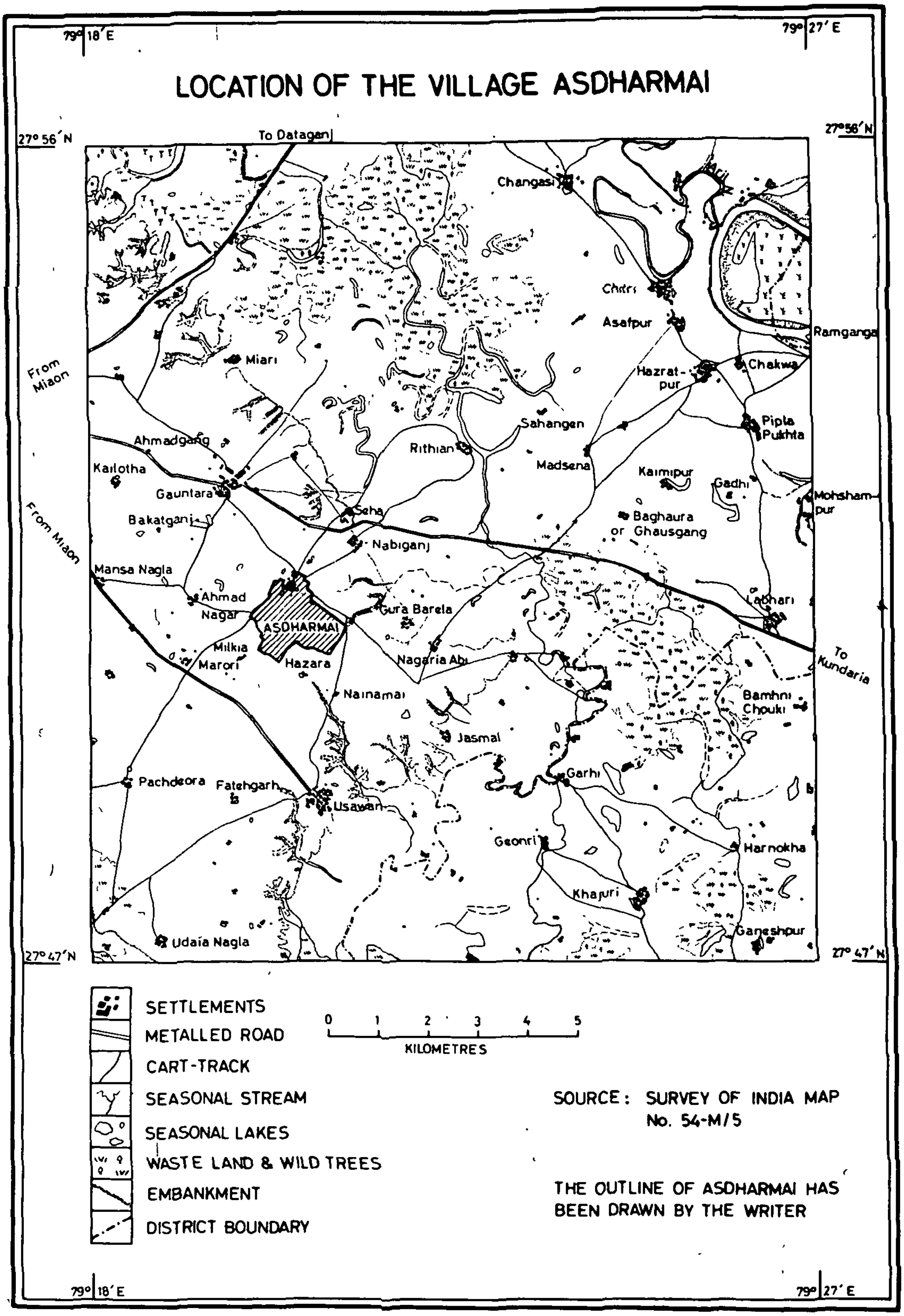
LOCATION OF THE VILLAGE ASDHARMAI
79° 18′ E
79° 27′ E
27° 56′ N
27° 47′ N
To Dataganj
From Miaon
To Kundaria
Changasi
Chitri
Asafpur
Ramganga
Hazrat-pur
Chakwa
Pipla Pukhta
Miari
Sahangen
Rithian
Madsena
Kaimipur
Gadhi
Mohsham-pur
Ahmadganj
Kailotha
Gauntara
Seha
Bakatganj
Baghaura or Ghausgang
Nabiganj
Mansa Nagla
Ahmad Nagar
ASDHARMAI
Gura Barela
Labhari
Milkia Marori
Hazara
Nagaria Abi
Nainamai
Bamhni Chouki
Jasmal
Garhi
Pachdeora
Fatehgarh
Usawan
Geonri
Harnokha
Khajuri
Ganeshpur
Udaia Nagla
SETTLEMENTS
METALLED ROAD
CART-TRACK
SEASONAL STREAM
SEASONAL LAKES
WASTE LAND & WILD TREES
EMBANKMENT
DISTRICT BOUNDARY
0 1 2 3 4 5
KILOMETRES
SOURCE: SURVEY OF INDIA MAP No. 54-M/5
THE OUTLINE OF ASDHARMAI HAS BEEN DRAWN BY THE WRITER

FIG.56

TABLE XXXII

Rainfall in the Kharif season, 1962 (Dataganj)

	Months					
	June	July	Aug.	Sept.	Oct.	Total
Rainfall in millimetres in the Kharif season 1962.	19.1	168.0	284.6	294.7	----	766.4
Rainy days in Kharif, 1962	4	10	12	12	----	
Average rainfall in millimeters	76.7	287.0	266.0	168.5	65.5	863.7

Table XXXII reveals that the rainfall in June and July was much below the average, whereas August and September got sufficiently larger rainfall than the average, but October was rainless. Besides October, the differences of the actual and the average rainfall is large in June, July and September. The total rainfall in the season is also considerably below the average.

TABLE XXXIII

Rainfall in the Rabi season, 1962-63 (Dataganj)

	M o n t h s					
	Nov.	Dec.	Jan.	Feb.	March	Total
Rainfall in millimetres in the Rabi season, 1962-63.	---	---	12.7	---	---	12.7
Rainy days in Rabi, 1962-63	---	---	1	---	---	1
Average rainfall in millimetres	2.6	7.4	19.3	19.3	11.6	60.7

Table XXXIII indicates that except January, there is no rainfall throughout the whole season. The rainfall in January was experienced in only one day and was lower than the month's average. This points out a severe failure of winter monsoon, resulting in drought conditions to crops. The total of the seasonal rainfall, being the amount of only a day's rainfall, is nearly one fifth of the average for the season. Such drought conditions and uncertainty of rainfall affect very much the quantity and quality of cropyields which in turn influence the economic conditions of the cultivators.

LAND CLASSIFICATION

The fields of the village have been classified according to soil fertility and productivity into A, B1, B11 and C quality lands (Fig. 57). The good quality lands (A) occupy an area of 134.502 acres in the village, being 34.7 per cent of the total land available for cultivation. This land is well-drained and has fertile loamy soil.[1] This soil is superior at the outskirts of the village settlement on account of continuous manuring by human faeces in the nearby fields. The superior soil of the village locally known as "gouhan" is regularly devoted to double cropping. The good quality lands are cropped twice a year, in both Kharif and Rabi seasons, and are also devoted to sugarcane cultivation which gives a larger yield and better quality than in any other type of land. The medium quality lands, subdivided

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1. Locally known as katehr.

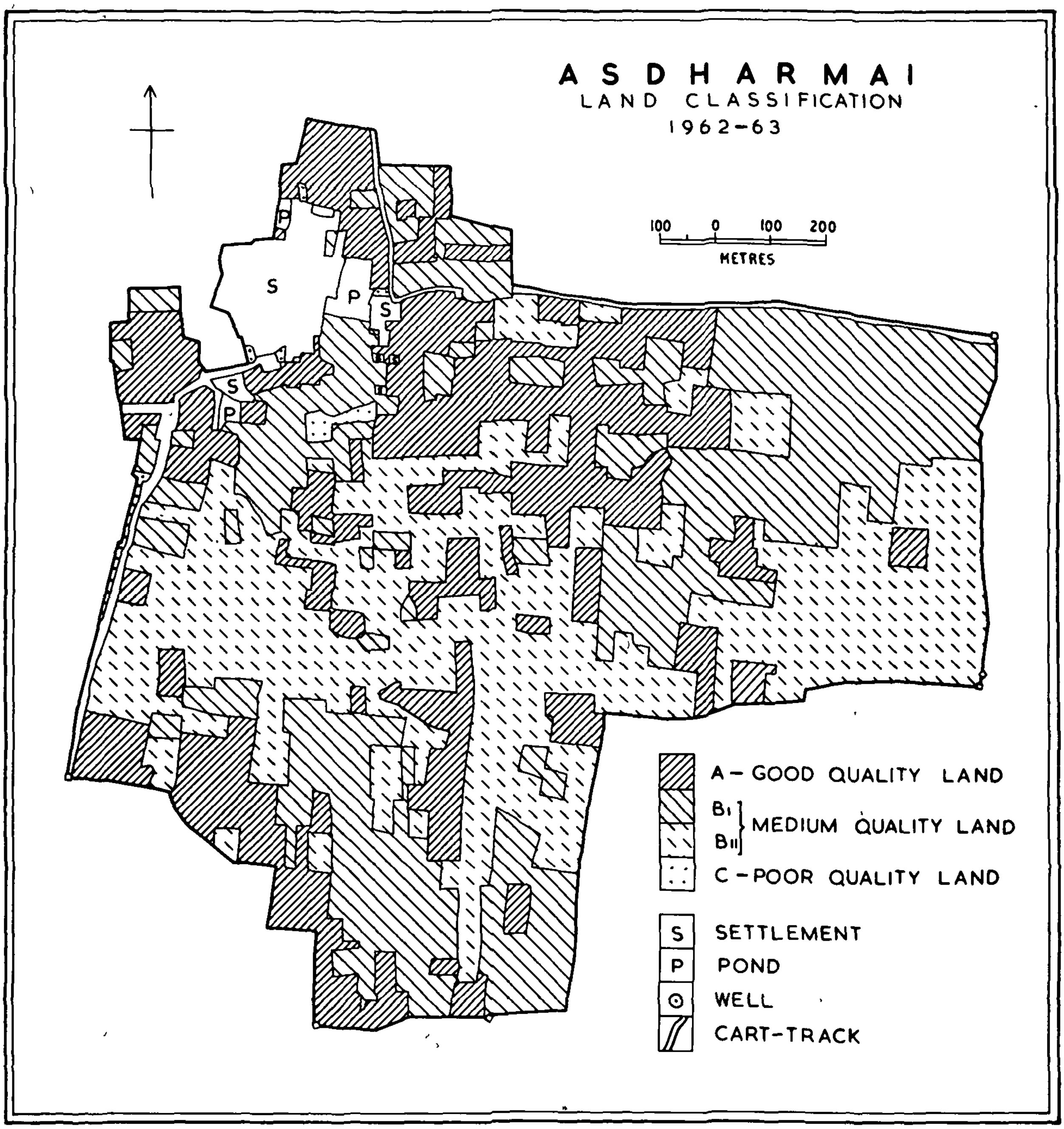

ASDHARMAI
LAND CLASSIFICATION
1962-63
100 0 100 200
METRES
S
P
S
S
P
A - GOOD QUALITY LAND
B I
B II
MEDIUM QUALITY LAND
C - POOR QUALITY LAND
S SETTLEMENT
P POND
WELL
CART-TRACK

FIG 57

into B_1 and B_{11} types, are inferior in crop production to the 'A' quality lands. The B_1 lands, texturally clayey loam, have an area of 96.607 acres. These lands are usually sown with rice or vegetables in the kharif or with gram mixed with either barley, peas or wheat in the rabi season. The B_{11} lands have the largest cultivated area of 159.140 acres in the village. The B_{11} type of land is sandy loam in texture. They are generally devoted to mixed crops of millets and pulses in the kharif or barley, peas and wheat in the rabi season. A small area of 1.625 acres, or 0.39 per cent of the whole village, remains unutilized as a waste land, because of the presence of saltish reh efflorescence.

IRRIGATION

The irrigated and unirrigated lands have been shown in Fig. 58. The rabi crops have larger irrigated area than that of kharif crops. It is because of the fact that only sugarcane, due to its greater water requirements, requires irrigation in the kharif season, while nearly all the crops of the rabi season require irrigation. However, in the rabi season only important crops like wheat, gram, peas, alone or mixed together , and vegetables are generally irrigated, whereas other cereal crops are rarely irrigated.

The main sources of irrigation in the village are ponds, mosonry and non-masonry wells and tube-well.

Only a few masonry wells which have Persian wheels are used for irrigation. The non-masonry wells are used in irrigation by indigenous methods.[1] A considerable area of the cultivated land is also irrigated

1. The indigenous methods of irrigation from wells include "Rahat" or "erath" on the large scale irrigation, and "dhekli" on a small scale. The irrigation from a pond is done with "dalia" method, on large scale, and dhekli, on small scale.

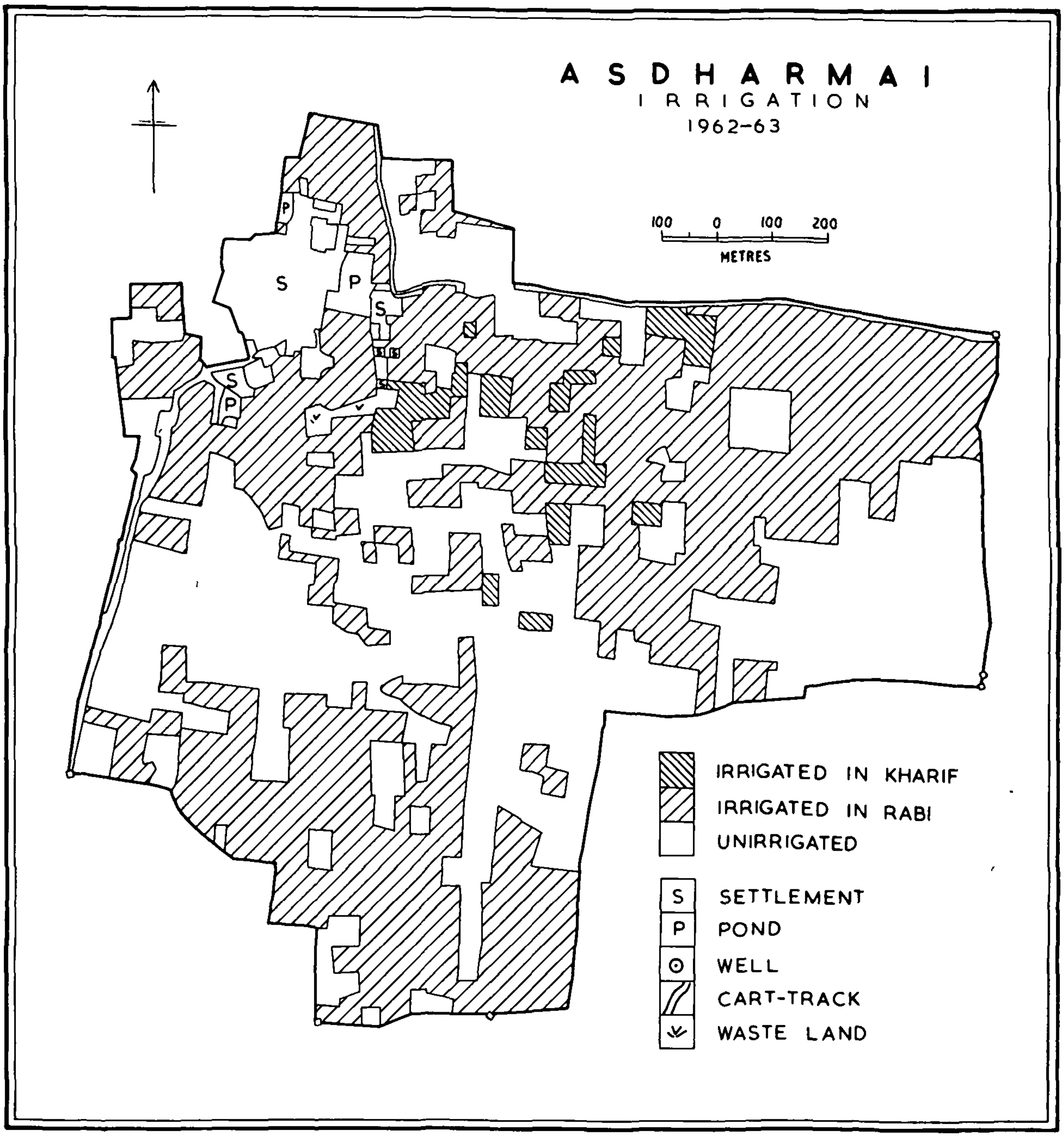

ASDHARMAI
IRRIGATION
1962-63
100 0 100 200
METRES
S
P
IRRIGATED IN KHARIF
IRRIGATED IN RABI
UNIRRIGATED
S SETTLEMENT
P POND
WELL
CART-TRACK
WASTE LAND

FIG 58

from the tube-well, situated in the village Nabiganj which lies in the north of this village.

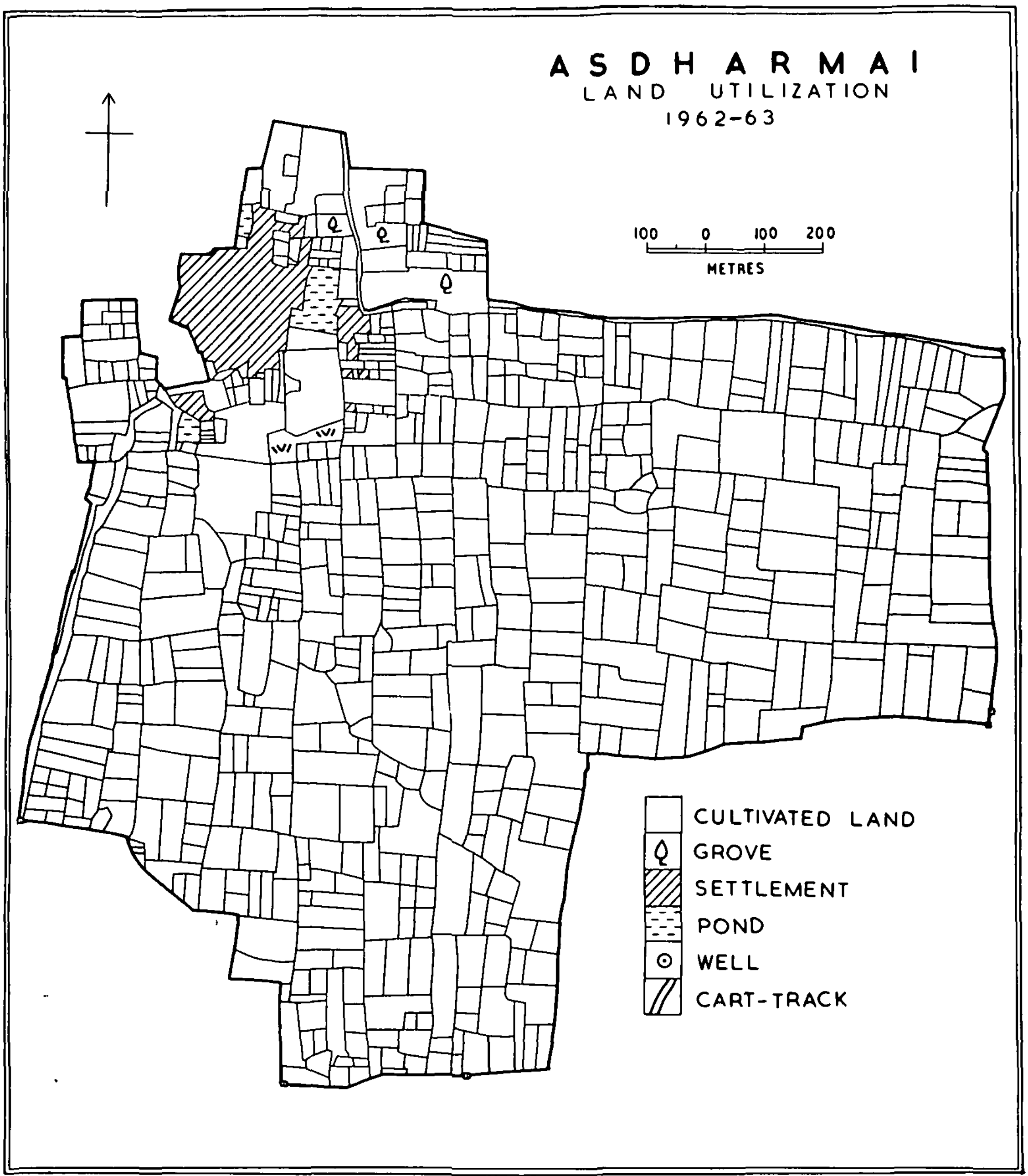
LAND UTILIZATION

The cultivated fields and lands under other uses in the year 1962-63 are shown in Fig. 59. The areas of different uses of land in the village and their individual percentages to the total area of the village are given in Table XXXIV.

TABLE XXXIV

Total area of the village 421.0 acres

Use of land	Area in acres	Percentage to the total area.
Cultivated land	388.249	92.22
Waste land	1.625	0.39
Grove	9.719	2.31
Settlement	12.563	2.98
Cart-track	6.563	1.56
Pond	2.281	0.54
Total	421.00	100.00



ASDHARMAI
LAND UTILIZATION
1962-63
100 0 100 200
METRES
CULTIVATED LAND
GROVE
SETTLEMENT
POND
WELL
CART-TRACK

FIG 59

The above Table shows that 92.22 per cent of the total area of the village is under cultivation and only 7.78 per cent is under the other uses alongwith groves. There are no meadows for cattle and no jungles to provide fuel to the villagers. Therefore the inhabitants prepare dung-cakes for fuel purposes which may be found piled up in numerous huge heaps on all corners of the village.

Most of the fields under cultivation are almost rectangular in shape. A big field is, however, subdivided into two or more sections according to the cultivator's own wish and convenience in order to produce two or more crops of the season separately.

LAND UTILIZATION IN THE KHARIF SEASON

The distribution of crops and other uses of land in the kharif season of 1962 are shown in Fig. 60. Table XXXV gives a summary of the area occupied by each crop and its percentages to the total cultivated land and to the net cropped land.

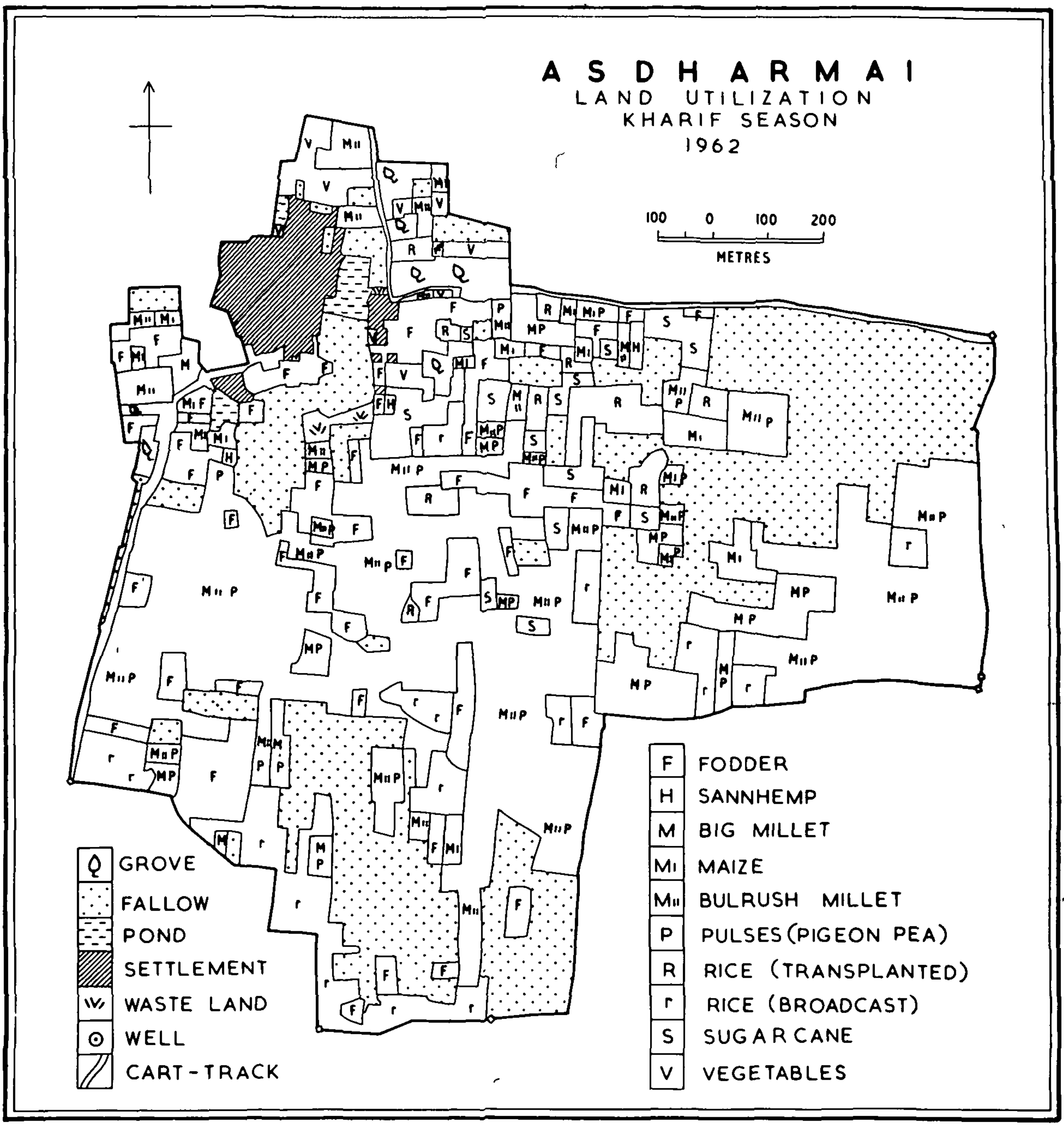

ASDHARMAI
LAND UTILIZATION
KHARIF SEASON
1962
100 0 100 200
METRES
GROVE
FALLOW
POND
SETTLEMENT
WASTE LAND
WELL
CART-TRACK
F FODDER
H SANNHEMP
M BIG MILLET
Mı MAIZE
Mıı BULRUSH MILLET
P PULSES (PIGEON PEA)
R RICE (TRANSPLANTED)
r RICE (BROADCAST)
S SUGARCANE
V VEGETABLES

FIG 60

TABLE XXXV

Total cultivated land ..... 388.249 acres

Net cropped land in the kharif season ..... 268.459 acres

Crops	Area in acres	percentage to total cultivated land	percentage to net cropped land	Total percentage to the total cultivated land	Total percentage to the net cropped land
GRAIN CROPS				53.60	77.51
Bulrush millet	19.219	4.95	7.16		
Bulrush millet and pulses	115.187	29.67	42.91		
Rice (broadcast)	28.969	7.46	10.79		
Rice (transplanted)	16.907	4.36	6.30		
Big millet and pulses	17.313	4.46	6.45		
Maize	9.219	2.37	3.43		
Maize & pulses	1.269	0.33	0.47		
OTHER CROPS				15.55	22.49
Fodder	41.688	10.74	15.53		
Sugarcane	12.750	3.28	4.75		
vegetables	5.594	1.44	2.08		
Sannhemp	0.344	0.09	0.13		
FALLOW	119.790	30.85		30.85	
Total	388.249	100.00	100.00	100.00	100.00

The above Table shows that in the kharif season 53.6 per cent of the total cultivated land is occupied by grain crops, 15.55 per cent is under other crops, whereas 30.85 per cent of the total cultivated land is under fallow. It is important that 77.51 per cent of the net cropped land of the season is occupied by grain crops, and the rest by other crops including sugarcane and vegetables.

Bulrush millet mixed with pulses (pigeon pea) occupies the largest kharif sown area. Among grain crops, the second and third ranking crop is of rice (broadcast and transplanted). Among non-grain crops, the largest is fodder crop, 15.53 per cent, followed by sugarcane which occupies 4.75 per cent of the net sown area in the kharif season. Vegetables occupy only 2.08 per cent of the net cropped area.

On account of the lack of soil-fertility due to irregular or insufficient manuring, the cultivators have to leave a large acreage of land, or 30.85 per cent, as fallow so that the soil may itself recuperate its fertility for cropping in the next season. The cultivators think that cropping in these fields after fallowing gives better yields to crops than the crops cultivated in both the season without fallowing.

LAND UTILIZATION IN THE RABI SEASON

The production of crops in the rabi season of 1962-63, and other uses of land are shown in Fig. 61. The Table XXXVI gives a summary of

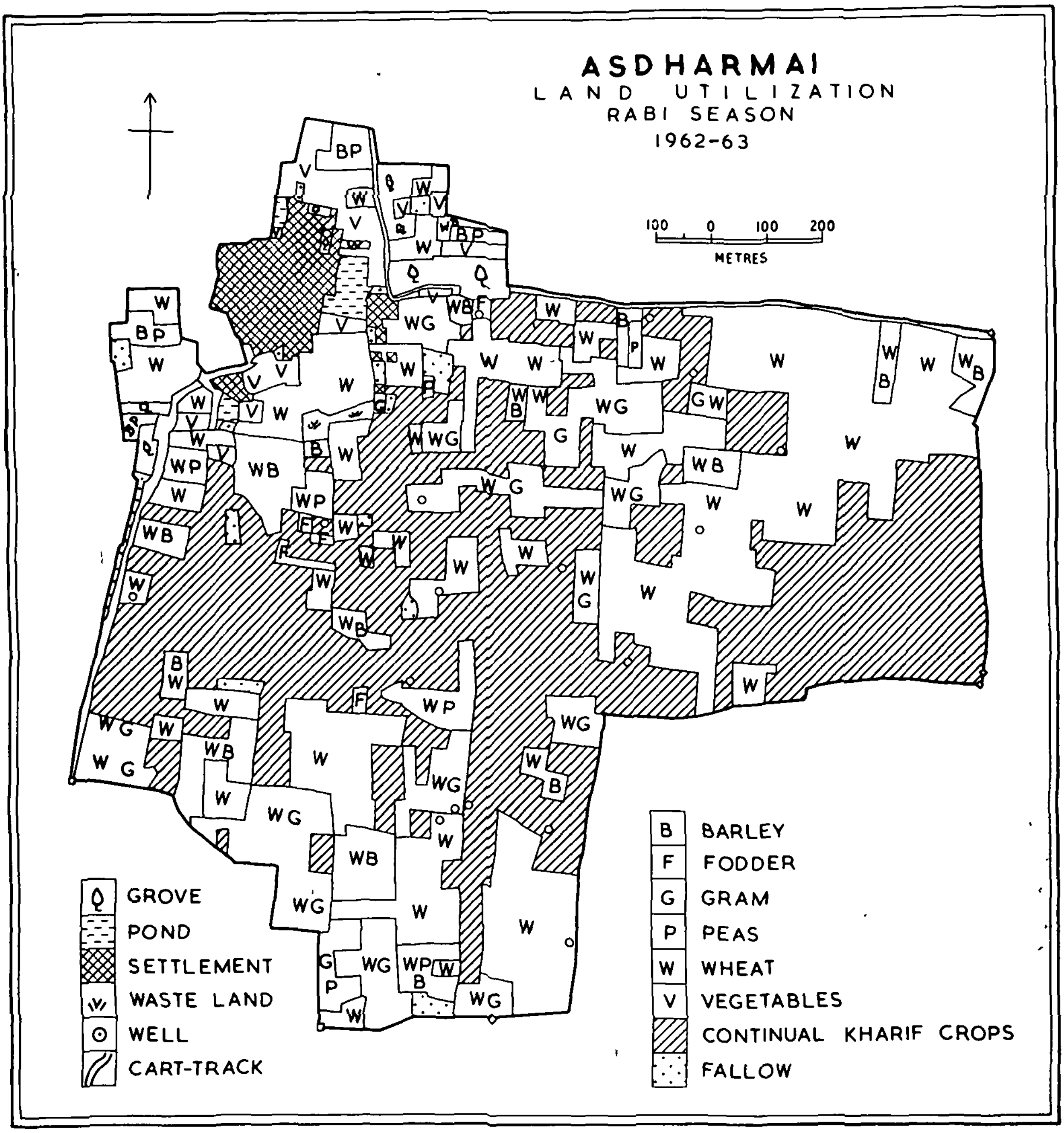

ASDHARMAI
LAND UTILIZATION
RABI SEASON
1962-63
100 0 100 200
METRES
GROVE
POND
SETTLEMENT
WASTE LAND
WELL
CART-TRACK
B BARLEY
F FODDER
G GRAM
P PEAS
W WHEAT
V VEGETABLES
CONTINUAL KHARIF CROPS
FALLOW

FIG 61

the crop land use together with the percentages of each crop to the total cultivated land and to the net cropped land in the village.

TABLE XXXVI

Total cultivated land ..... 388.249 acres

Net cropped land in the rabi season ..... 213.742 acres

Crops	Area in acres	Percentage to the total cultivated land.	Percentage to the net cropped land	Total percentage to the total cultivated land	Total percentage to net cropped land
GRAIN CROPS				51.06	92.76
Wheat	110.094	28.36	51.51		
Wheat gram	40.062	10.32	18.74		
Wheat barley	30.000	7.73	14.07		
Wheat peas	3.813	2.01	3.65		
Barley peas	6.148	1.58	2.88		
Barley,peas,wheat	2.375	0.61	1.11		
Peas gram	1.375	0.36	0.65		
Barley	0.375	0.09	0.18		
OTHER CROPS				41.73	7.24
Vegetables	12.625	3.25	5.90		
Fodder	2.313	0.60	1.08		
Potato	0.562	0.14	0.26		
Continual kharif crops	146.519	37.74			
FALLOW	27.988	7.21		7.21	
TOTAL	388.249	100.00	100.00	100.00	100.00

It will be noticed from the above Table that the net sown area in the rabi season is slightly less than the kharif sown area. The area under fallow is less in the rabi season as compared to that of kharif season. The continual kharif crops, i.e., pulses (pigeon pea, arhar) and sugarcane occupy 146.519 acres or 37.74 per cent of the total cultivated land.

The cereal crops occupy 92.76 per cent of the rabi sown area, whereas other crops have 7.24 per cent only. Wheat crop occupies about half of the net cropped land in the rabi season. The crops of wheat mixed with either gram, barley and peas, occupy 36.46 per cent of the net rabi sown area. The gram or peas are not grown alone.

In the non-cereal crops, vegetables occupy about 6 per cent of the net cropped area, while I per cent of the net rabi cropped area is under fodder crops.

DOUBLE CROPPED LAND

Fig. 62 shows the area under cultivation which is cropped in both kharif and rabi seasons. The area under double cropping is 121.752 acres which comes to 31.36 per cent of the total cultivated land in the village. All the land under double cropping possesses good quality (A) land.

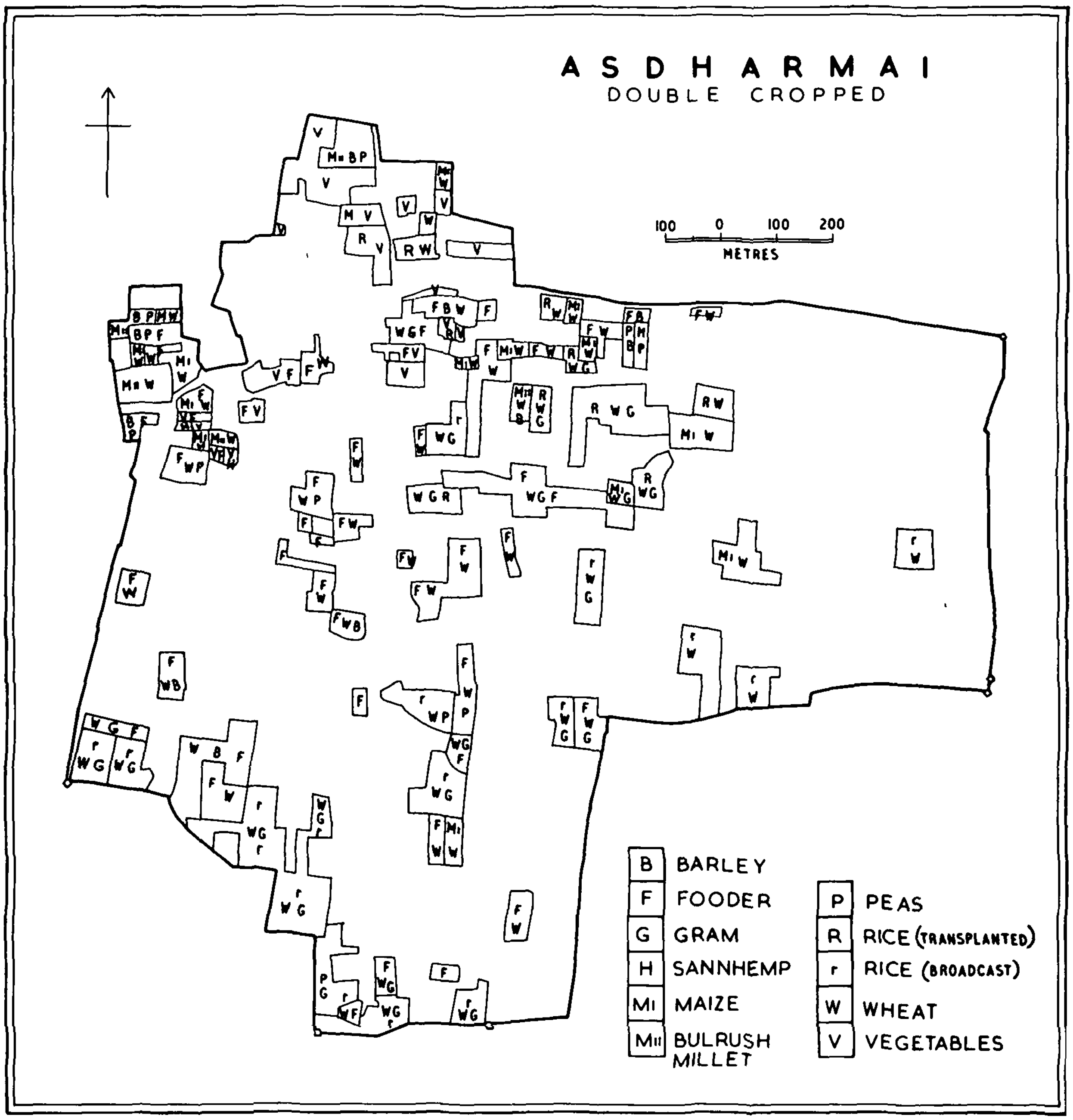

ASDHARMAI
DOUBLE CROPPED
100 0 100 200
METRES
B BARLEY
F FOODER
G GRAM
H SANNHEMP
MI MAIZE
MII BULRUSH MILLET
P PEAS
R RICE (TRANSPLANTED)
r RICE (BROADCAST)
W WHEAT
V VEGETABLES

FIG 62

ROTATION OF CROPS

In accordance with the soil characteristics of fertility, climatic considerations of variations in rainfall, the considerations of presence or absence of facilities of irrigation and manuring, the various crops are rotated from year to year. But, as a matter of fact, there are no hard and fast rules to adopt certain rotations of crops in the village. They may be different from those in other villages according to differences cited above and dependence of cultivators' wills. The best agricultural lands are usually cropped in successive seasons for years continuously. The need of cultivator is also a factor in his choice of crop to be grown. The general rotations of crops are as follows:

Crop year	Kharif season	Rabi season
First year	Rice/Sugarcane	Wheat/wheatgram/ sugarcane (contd.)
Second year	Millets/Sugarcane (Contd.)	Wheat/barley/peas/ sugarcane
Third year	Millets and pulses,maize	Wheat/wheat barley/wheat gram/wheat peas.

The crop rotation mentioned above is related with the good quality (A) lands. There is a little difference in the medium quality B_1 lands.

The rotation of crops in B_1 clayey loam soils is as follows:

Crop Year	either in Kharif Season		or in Rabi Season
First year	Rice (Transplanted)/ rice (Broadcast)	or	Wheat-gram, peas-gram
Second year	Rice (Transplanted)/ (Broadcast)	or	Lentil, peas-gram/ barley-wheat-gram.
Third year	Rice (Broadcast)/Fooder/ Sannhemp	or	peas-gram/barley-peas-gram.

The crop rotation in the above type of lands has large production of rice and gram especially. But the crop rotation found in the sandy loam soil type (B_{11}) of land is quite different from B_1 lands, which is as follows:

Crop year	either in Kharif Season		or in Rabi Season
First year	Millets/Millets with pulses	or	Wheat/wheat-barley[1]/wheat-peas
Second year	Maize/Millets/millets with pulses	or	Barley-wheat/barley-peas wheat-peas
Third year	maize with pulses/ millets with pulses/ maize	or	Barley-wheat-peas[2]/wheat-barley

1. Wheat-barley mixed is locally known as '<u>Gojhi</u>' or '<u>gojhai</u>'.

2. Mixed crop of barley-wheat-peas (with or without gram) is locally called as '<u>bejhar</u>' or '<u>bijhra</u>', the diet for poor people in general.

In the B_{11} type of land, rice production is rare due to porosity of the soil; on the other hand, millets, alone or with pulses and maize, alone or with pulses, in the kharif, and barley, peas and mixed careals in the rabi season are generally grown which presents a somewhat contrasting phenomenon in cropping system to the B_1 lands where rice, gram and peas predominate.

The deficiency of rainfall in the kharif season is well correlated with the cropping of the season, as most of the kharif sown area, 60.42 per cent of the net cropped land, is under millet and maize crops while other cereal-crops have only 17.09 per cent. It is because millet and maize-crops flourish well in less rainfall of the rainy season; while excessive rainfall harms pulses, millets and maize crops. The large fallow land in the kharif season, 30.85 per cent and the small fallowing, 7.21 per cent in the rabi season indicate that large land being fallow in kharif has been sown in the rabi season. It is why 92.79 per cent of the total cultivated land is under various crops in the rabi season. It is also remarkable that 15.66 per cent of the net cropped area in kharif was under non-food crops, whereas about 1 per cent of the net cropped land in the rabi season was under non-food crops. It is further remarkable that the crops do not include any green manure crop during the crop year, nor any part of the land is put as meadow, except the waste-land being a very small amount (1.625 acres) of land which does not suffice the pasturing purposes.

LAND USE AND POPULATION

The total population in the village is 613 which is actually dependent upon the produce of the village. Table XXXVII shows the per capita share in the total land, total cultivated land, net sown areas in the kharif and rabi seasons, gross cultivated land and the double cropped land.

TABLE XXXVII

Total population of village Asdharmai : 613

(Areas in acres)

	Total area of the village	Total cultivated land available[1]	Net cropped land in the kharif season	Net cropped land in the rabi season	Gross cultivated land (both of kharif & rabi	Double cropped land
	421.0	388.249	268.459	213.742	482.201	121.752
Land per head of population	0.687	0.633	0.438	0.349	0.787	0.199

The above Table explains that per capita share in the total cultivated land is 0.633 acre, which decreases to 0.438 acre in the kharif season owing to large fallowing and 0.349 acre in the rabi season mainly due to continual kharif crops occupying 146.519 acres or

1. The cultivated land includes 27.800 acres of land which was under fallowing in both kharif and rabi seasons of 1962-63.

37.74 per cent of the total cultivated land. The gross cultivated land of kharif and rabi per head of population amounts to 0.787 acre. The actual amount of land which supports one person in the village is thus 0.787 acre. On the other hand, the land which is cropped twice a year amounts to only 0.199 acre per head.

Out of the total population, 96.5 per cent are primary rural or cultivators and the rest are secondary rural who depend upon the produce of the cultivating class through their subsidiary services to the former; they include tailors, carpenters, blacksmiths, shop-keepers and potters.

CALORIC INTAKE

The yield of crops varies from village to village. The yields may have a slight variation from year to year, and if seen minutely, from field to field in the same season, in accordance with the soil conditions, manuring, irrigation, changing weather conditions and differences in soil preparations, seeding and weeding. Table XXXVIII A gives the yields[1] of various crops grown in the kharif and rabi seasons.

On the basis of crop-yields, the total production of various food crops have been calculated by the writer and the total caloric intake per head per day has also been ascertained in Table XXXVIII B.

1. The yields are given as told by the cultivators.

TABLE XXXVIII A

Crops	Yield per acre (in kilograms)
Bulrush millet (sown with pulses)	224
Bulrush millet (sown alone)	317
Big millet (sown with pulses)	168
Maize (sown with pulses)	299
Maise (sown alone)	467
Rice (broadcast)[1] unhusked	485
Rice (transplanted)[2] unhusked	570
Canesugar (gur)[3]	1140
Wheat	448
Barley	457
Wheat-gram (mixed)	457
Peas-gram (mixed)	473
Wheat-peas (mixed)	466
Barley-peas (mixed)	461
Barley-peas-wheat (mixed)	466
Potato	1866

1. The broadcast rice is locally named as '<u>dhan</u>'

2. The transplanted rice, which is particularly meant for milling, is known as '<u>moonji</u>' or '<u>aliyara</u>' before husking.

3. The yield is calculated in terms of weight of gur produced from sugarcane of one acre.

TABLE XXXVIII B
FOOD BALANCE SHEET
Village ASDHARMAI
(in Kilograms)

Population 613

Year 1962-63

Commodity	Production	Total Production	Export	Import	Available Supply	Seed	Food (Gross)	Extraction rate per cent	Food (Net)	Per head Consumption Kilograms per year	Grams per day	Calories per day
Bulrush millet (sown with pulses)	25801.9	31894.3	10631.4	-	21262.9	501.3	20761.6	95	19723.5	32.175	88.1	306.6
Bulrush millet (sown alone)	6092.4	-	-	-	-	-	-	-	-	-	-	-
Pulses (pigeon pea)(sown with millets or maize)	14982.1	14982.1	-	-	14982.1	187.3	14794.8	95	14055.0	22.928	62.3	213.7
Big millet (sown with pulses)	2908.6	2908.6	363.6	-	2545.0	48.5	2496.5	95	2371.7	3.869	10.6	36.4
Maize	4305.3	4684.7	-	-	4684.7	52.4	4632.3	89	4122.7	6.725	18.4	65.5
Maize (sown with pulses)	379.4											
Rice (Transplanted)	9636.9	9636.9	-	-	9636.9	143.1	9493.8	66⅔	6329.2	10.325	28.3	104.6
Rice (Broadcast)	14049.9	14049.9	-	-	14049.9	653.5	13396.3	66⅔	8930.9	14.569	39.9	142.4
Sugar (gur)	14535.0	14535.0	1453.0	-	13082.0	1189.7	11892.3	-	11892.3	19.400	53.2	186.7
Wheat	49322.1	49322.1	-	-	49322.1	4906.4	44415.7	90	39974.1	65.216	178.7	596.9
Wheat and gram	18308.3	18308.3	-	-	18308.3	1842.8	16465.5	92	15148.3	24.712	67.7	234.2
Wheat and peas	3640.9	3640.9	-	-	3640.9	329.6	3311.3	92	3046.4	4.969	13.7	46.6
Peas and gram	650.4	650.4	-	-	650.4	64.6	585.8	95	556.5	0.908	2.5	8.8
Barley	171.4	171.4	-	-	171.4	16.9	154.5	70	108.2	0.176	0.5	1.7
Barley and peas	2834.2	2834.2	-	-	2834.2	282.8	2551.4	82	2092.1	3.413	9.3	31.5
Barley and wheat	13560.0	13560.0	-	-	13560.0	1350.0	12210.0	80	9768.0	15.935	43.7	145.5
Barley, peas and wheat	1106.8	1106.8	-	-	1106.8	106.8	1000.0	85	850.0	1.387	3.8	12.8
Potato	1048.7	1048.7	-	1048.7	2097.4	83.7	2013.7	85	1711.6	2.792	7.6	5.3
Total												2138.2

Table XXXVIII B shows that the villagers export some of their crop produce to meet their other needs. The per capita daily intake of calories is 2138, showing an adequate supply of food. Wheat, bulrush millet, wheat-gram, pigeon pea and gur (unrefined sugar) are in order the main contributors of calories in the village diet.

POTENTIAL PRODUCTION UNIT

On the basis of varying yields of crops, the different types of agricultural lands in the village have been evaluated by the writer to measure their potential productivity. Table XXXIX shows the relative ratings of different types of cultivated lands and total numbers of Potential Production Units, as computed for each of them.

TABLE XXXIX

Average yield per acre of normal standard farmland in the village:

482 kilograms or 1 P.P.U.

Type of Lands	Area in acres	Average yield per acre in kilograms	Productivity rating per acre	Number of P.P.U.
A	134.502	582	1.21	162.747
B_1	94.607	482	1.00	94.607
B_{11}	159.140	327	0.68	108.215
C	1.625	0	0	0
Total	389.874			365.569

The above Table shows that the Potential Production Units are lower than the total area available for cultivation. It is because of the greater area occupied by B_{11} quality lands which have only 0.68 productivity rating per acre. Owing to lower productivity rating , these lands contribute only a smaller number of P.P.U. as against the large acreage occupied by them. The good quality (A) lands have the second largest area which is equal to 1.21 P.P.U. per acre, resulting in its largest contribution to the total number of P.P.U. The B_1 quality lands possess the normal standard productivity which is equal to 1 P.P.U. per acre.

However, if the facilities of manuring, fertilizers and irrigation are provided or extended sufficiently to the B_1 lands, a good proportion of these lands may well be turned into A quality lands. Similarly, the productivity standard of the B_{11} lands may be sufficiently increased to that of B_1 lands. In considerations of productivity value, it is important that absence or inadequate supply of manure or irrigation or both lowers the fertility and productive value of the cultivated land. Due to the deficiency of each of them in the village the soils have considerably suffered.

LAND UTILIZATION IN MOHAMMADPUR AZAMPUR

LOCATION

The village Mohammadpur Azampur, lying in the Shahjahanpur Tahsil, is located at 79°50'20" E. long. and 27°46'31" N. lat. The village is situated in a fertile level plain of loamy soil. It is 3 kilometres south of the village Jamaur and 3 kilometres northeast of the town Kant. It is situated to the north and northwest of the seasonal river Garai (Fig.63). The village is bounded by the villages Sahramau and Barmaba in the west, Aliapur in the southwest, Akhtiarpur and Sindhauli in the north, while the eastern and the southern boundaries are formed by the river Garai which separates it from village Urhaila Girdharpur.

The village has no easy means of communication and transport with the neighbouring villages, particularly with those which are situated across the river. Cart-tracks are the only means of contact with the other villages. At the end of the winter season and in the hot dry summer months, the river is easily crossed for transport and communications with the villages lying at the other side of the river.

CLIMATE

No climatic data are recorded in the village. The rainfall data recorded at the Tahsil headquarters of Shahjahanpur which is only 10 kilometres away from the village, can well be considered as approximately the same for the rainfall conditions in the village area. Tables XL and XLI give the rainfall data.

The Table XL shows that the month of June received a good rainfall which was more than the average, but the month of July, during which a good rainfall is needed, experienced a remarkably very deficient rainfall with a

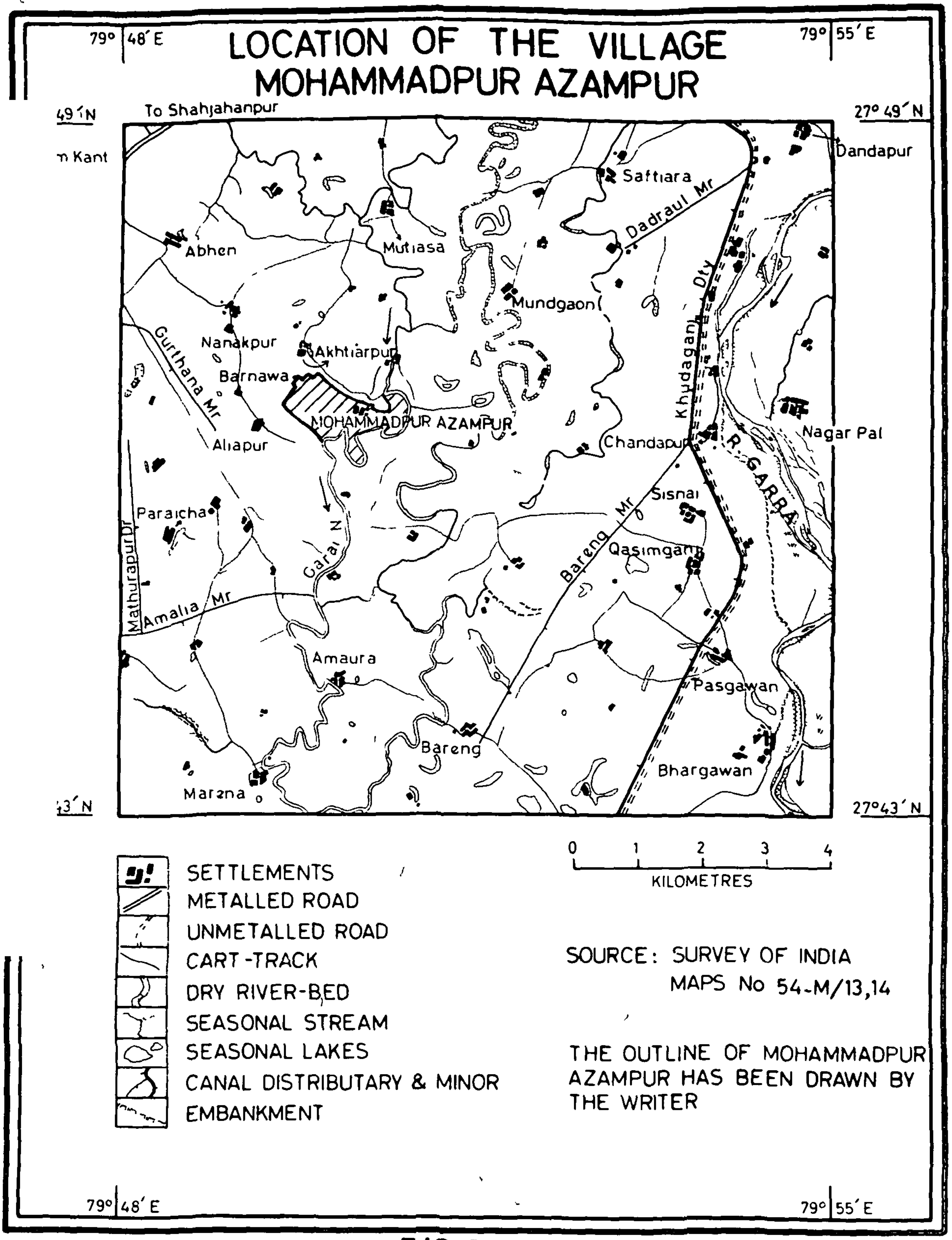

LOCATION OF THE VILLAGE
MOHAMMADPUR AZAMPUR
79° 48′ E
79° 55′ E
27° 49′ N
27° 43′ N
To Shahjahanpur
Dandapur
Saftiara
Dadraul Mr
Abhen
Mutiasa
Mundgaon
Khudaganj Dty
Nanakpur
Akhtiarpur
Barnawa
Gurthana Mr
MOHAMMADPUR AZAMPUR
Aliapur
Chandapur
Nagar Pal
R. GARRA
Sisnai
Paraicha
Bareng Mr
Qasimganj
Garai N
Mathurapur Dr
Amalia Mr
Amaura
Pasgawan
Bareng
Bhargawan
Marzna
0 1 2 3 4
KILOMETRES
SETTLEMENTS
METALLED ROAD
UNMETALLED ROAD
CART-TRACK
DRY RIVER-BED
SEASONAL STREAM
SEASONAL LAKES
CANAL DISTRIBUTARY & MINOR
EMBANKMENT
SOURCE: SURVEY OF INDIA
MAPS No 54-M/13,14
THE OUTLINE OF MOHAMMADPUR AZAMPUR HAS BEEN DRAWN BY THE WRITER

FIG. 63

deficiency of 222.8 millimetres in the month. The rainfall in August, being considerably below the average, was not much deficient. The deficient rainfall in July resulted in a considerable harm to rice crops, particularly in those parts where irrigation facilities were not available. The crops of millets, pulses and maize were, however, unaffected ~~due~~ owing to their lower water requirements. The month of October with an average rainfall of 63.7 millimetres, was rainless in 1962.

Table XL

Rainfall in the Kharif Season, 1962 (Shahjahanpur)

	MONTHS					
	June	July	August.	Sept.	Oct.	Total
Rainfall in millimetres in the kharif season, 1962	145.8	83.3	232.9	197.1	-	659.1
Rainy days in the kharif, 1962	4	4	11	5	-	
Average rainfall in millimetres	118.9	306.1	294.3	186.1	63.7	969.1

The Table XLI reveals that the sowing period for rabi crops (November and December) received very low rainfall while January received more rainfall than the monthly average, and it was sufficient for the rabi crops.

Table XLI

Rainfall in the Rabi Season, 1962-63 (Shahjahanpur)

	MONTHS					
	Nov.	Dec.	Jan.	Feb.	March	Total
Rainfall in millimetres in the rabi season, 1962-63	-	1.7	30.5	2.3	22.1	54.9
Rainy days in rabi, 1962-63	-	1	2	1	2	
Average rainfall in millimetres	2.6	6.9	21.7	19.9	13.0	64.1

February received a considerably less rainfall than its average.

LAND CLASSIFICATION

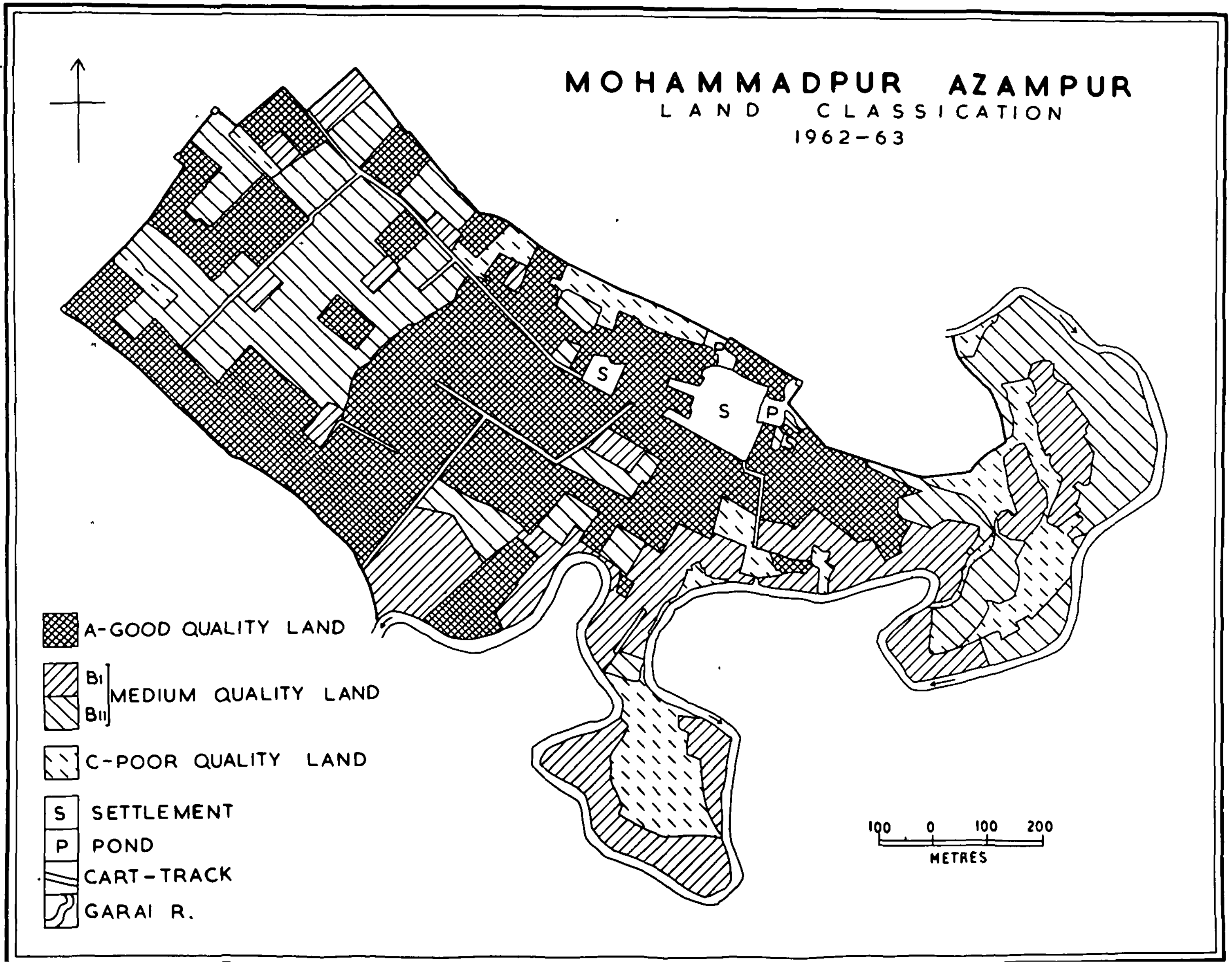
The fields of the village have been classified into the good quality (A), medium quality (B) and poor quality (C) lands on the basis of fertility and productivity. The medium quality (B) lands have further been sub-divided into BI and BII types (Fig.64).

The good quality (A) lands[1] extend over an area of 103.46 acres which come to 38.2 per cent of the total land under cultivation.The good quality (A) lands are also found on the outskirts of the village site where the soil, locally called '<u>gohani</u>' is very fertile due to regular application of human faeces throughout the year. The good qualtiy (A) lands are devoted to double cropping and to the cultivation of sugarcane.

The soil of the medium quality BI lands are inferior to A quality lands. However, they are superior to BII quality lands in productivity, particularly for rice, wheat and gram, the mostly grown crops of the village. Both the BI and BII quality lands are cropped in either the kharif season or in the rabi season, and these are left fallow during the other season.

The area of BI lands is 53.81 acres or 20.2 per cent of the total land under cultivation in the village. These lands are particularly devoted to rice and gram. The area of BII lands is 108.56 acres or 40.8 per cent of the total area under cultivation. The chief crops of these lands are millets, pulses, maise, barley (alone or mixed with other cereals). Potato and fodder crops are main among non-cereal crops of these lands. The poor quality (C) lands have an area of 13.16 acres or 4.5 per cent of the total area of the village. These lands are wastes due to undesirable '<u>reh</u>' formation.

1. The good quality (A) lands in the village are known as '<u>goind</u>' and '<u>Kachhiana</u>', the latter is cropped with vegetables.


MOHAMMADPUR AZAMPUR
LAND CLASSICATION
1962-63
A-GOOD QUALITY LAND
BI
BII
MEDIUM QUALITY LAND
C-POOR QUALITY LAND
S SETTLEMENT
P POND
CART-TRACK
GARAI R.
100 0 100 200
METRES
S
S
P

IRRIGATION

The cultivated areas, sub-divided into irrigated and unirrigated lands, are shown in Fig.65. The irrigated area is smaller in the kharif season and is larger in the rabi season. Sugarcane is the only crop irrigated in the kharif season because of its larger water requirements than the other kharif crops. Most of the irrigation is done in the rabi season.

The peak period of irrigation is generally from early January to the middle of February. The rainfall in this period remains generally scanty and therefore irrigation is necessary for crops like wheat, gram, peas and potato.

The sources of irrigation in the village are the river, ponds, masonry and non-masonry wells. 'Rahat'[1] at masonry wells and 'charas' and 'dhekli' at non-masonry wells are used for irrigation. The masonry wells in the village are very few, while non-masonry wells are seasonal and temporary. One acre of land is normally irrigated in a day from either the river, pond or masonry well. The 'bokey' method of irrigation employs four persons who often include labourers and occasionally the cultivators themselves in which women occasionally participate.

The cost of irrigation in the year of inquiry per irrigation per acre was rupees 8.00 to irrigate from the river or a pond and rupees 10.00 from a masonry well by 'rahat'.

LAND UTILIZATION

The fields under cultivation and other uses in the year 1962-63 are shown in Fig.66. The areas of different uses of lands in the village and their individual percentages to the total area of the village are given in the Table XLII.

---

1. The 'rahat' is the Persian Wheels,, 'charas' is for large scale irrigation and 'dhekli' is for small scale irrigation. The 'bokey'(lift) method has a basket made from bamboo panes, tied with ropes on its four corners and two or four men lift the water from a pond or river to the level of the land to be irrigated. This system is also known as 'dhal' or 'dal'.

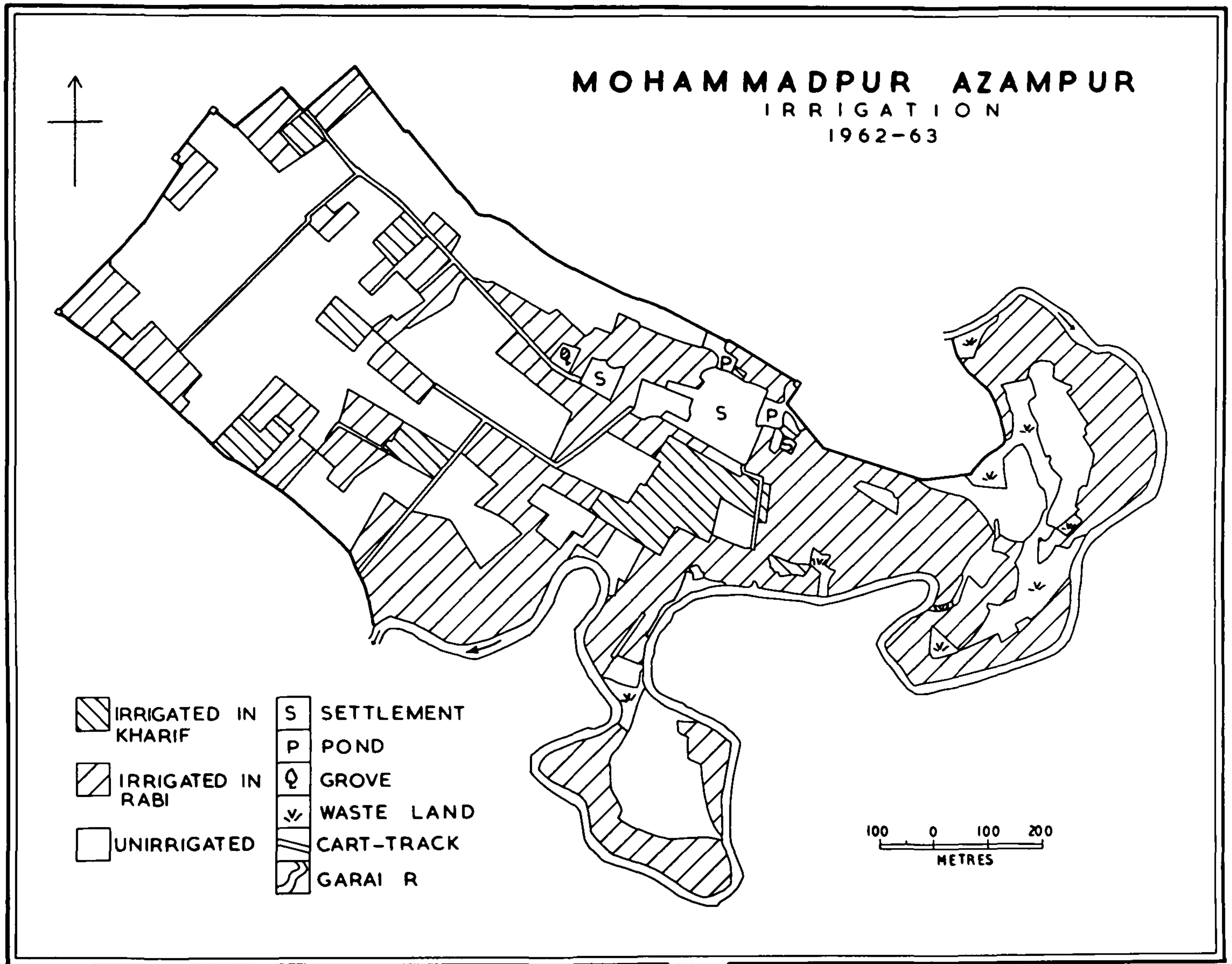

MOHAMMADPUR AZAMPUR
IRRIGATION
1962-63
IRRIGATED IN KHARIF
IRRIGATED IN RABI
UNIRRIGATED
S SETTLEMENT
P POND
GROVE
WASTE LAND
CART-TRACK
GARAI R
100 0 100 200
METRES
S
P

FIG. 65

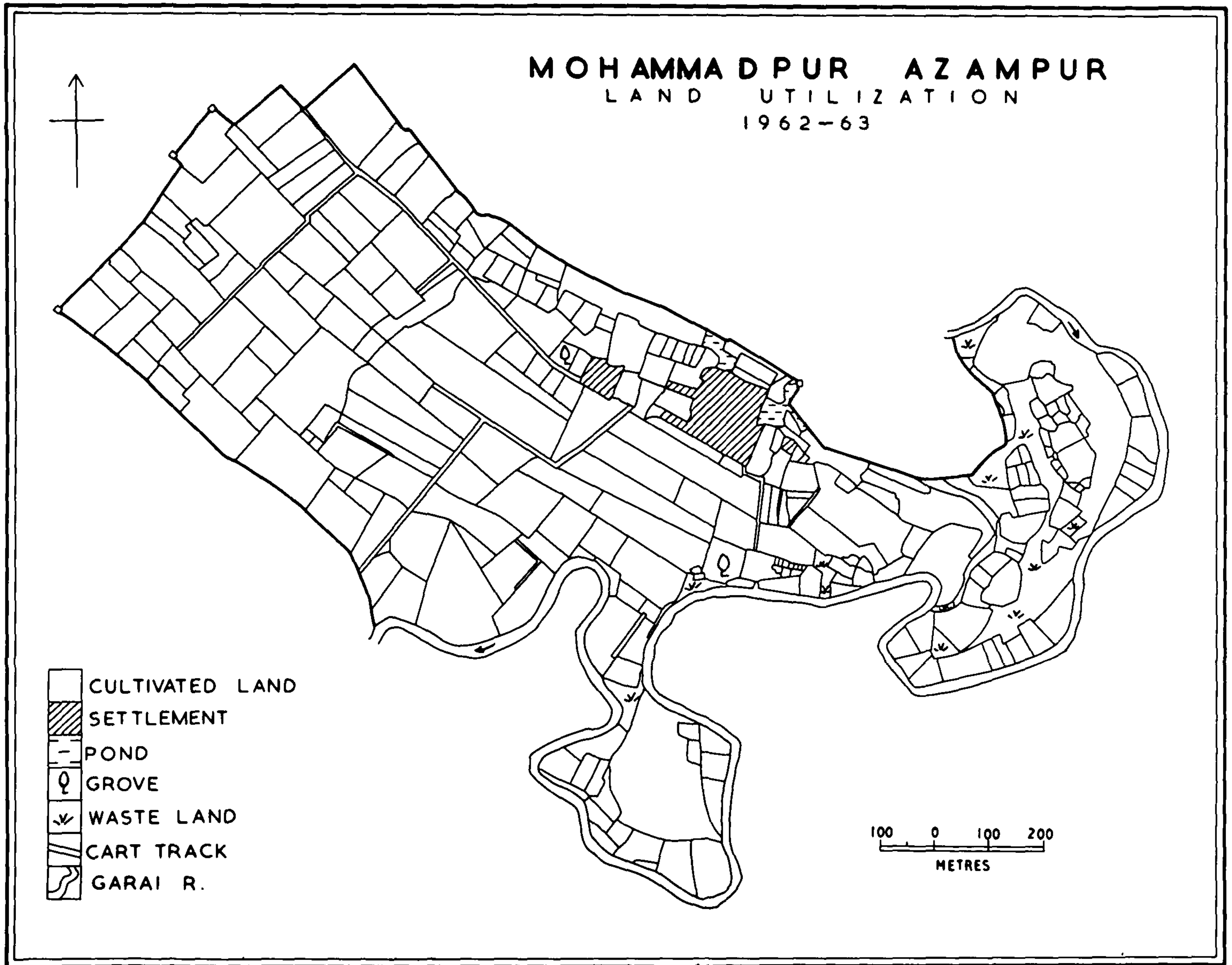

MOHAMMADPUR AZAMPUR
LAND UTILIZATION
1962–63
CULTIVATED LAND
SETTLEMENT
POND
GROVE
WASTE LAND
CART TRACK
GARAI R.
100 0 100 200
METRES

FIG.66

Table XLII

Total Area of the Village ... 291.93 acres

Use of Land	Area in acres	Percentage to the total area
Seasonal stream	0.93	0.32
Cultivated land	265.83	91.06
Waste land	13.16	4.50
Cart-track	3.62	1.24
Grove	0.33	0.11
Settlement	6.16	2.11
Pond	1.68	0.58
Irrigation channel	0.22	0.08
Total ...	291.93	100.00

The Table reveals that 91.06 per cent of the total village area is under cultivation, while 8.94 per cent includes all other uses of land including the waste land, grove, settlement, ponds, irrigation channel and the area under the river-bed. There are no meadows for cattle and no woodlands for fuel purposes. The people, therefore, prepare thousands of dung-cakes without any hesitation and pile them up into scores of dung-heaps to meet the fuel needs for all the year round. These heaps of different size and shape are found on all sides of the village site.

The fields under plough are almost rectangular in shape. The '<u>bhumidhar</u>', *(the owner of the field) may sub-divide a field into two or more* sections for different crops, but the sub-division is only temporary. The sub-division, according to the need and will of the cultivator, is a usual feature of cropping in the field with a large area.

LAND UTILIZATION IN THE KHARIF SEASON

The distribution of crops and other uses of land in the kharif season of 1962 are depicted in Fig.67. Table XLIII shows a summary of the area occupied by each crop and its percentage to the total cultivated land and to the net cropped land.

Table XLIII

Total Cultivated Land ... 265.83 acres

Net Cropped Land in the Kharif Season ... 162.81 acres

Crops	Area in acres	Percentage to the total cultivated land	Percentage to the net cropped land	Total percentage to the total cultivated land	Total percentage to the net cropped land
Grain Crops				51.41	83.95
Rice (broadcast)	45.72	17.20	28.08		
Big millet and pulses (pigeon pea)	39.19	14.74	24.07		
Rice (transplanted)	18.01	6.77	11.06		
Big millet and bulrush millet	13.03	4.90	8.00		
Maize	12.55	4.72	7.71		
Big millet	6.99	2.63	4.29		
Big millet and (other) pulses	0.64	0.24	0.39		
Bulrush millet	0.56	0.21	0.35		
Other Crops				9.83	16.05
Sugarcane	19.14	7.20	11.76		
Fodder	5.20	1.96	3.20		
Vegetables	1.78	0.67	1.09		
Fallow	103.02	38.76		38.76	
Total ...	265.83	100.00	100.00	100.00	100.00

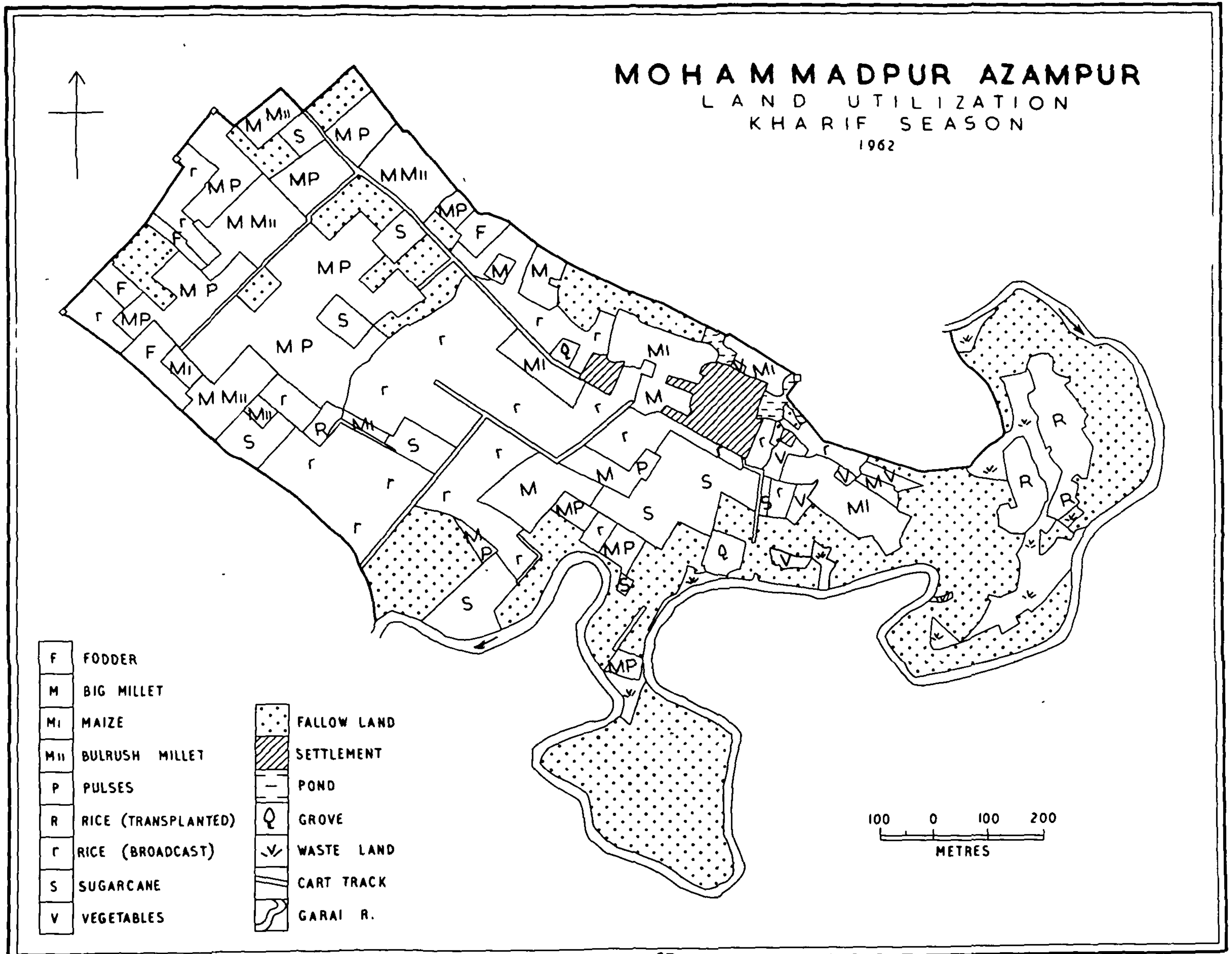

MOHAMMADPUR AZAMPUR
LAND UTILIZATION
KHARIF SEASON
1962
F FODDER
M BIG MILLET
MI MAIZE
MII BULRUSH MILLET
P PULSES
R RICE (TRANSPLANTED)
r RICE (BROADCAST)
S SUGARCANE
V VEGETABLES
FALLOW LAND
SETTLEMENT
POND
GROVE
WASTE LAND
CART TRACK
GARAI R.
100 0 100 200
METRES

FIG.67

The Table XLIII reveals that 61.24 per cent of the cultivated land in the village is cropped in the kharif season whereas 38.76 per cent is under fallow. The Table further shows that out of the net cropped land in the season, 83.95 per cent is occupied by cereal crops and the rest 16.05 per cent is under non-cereal crops.

Among the grain crops, the major crops are rice (broadcast) and big millet sown with pulses (pigeon pea) which have 28.08 per cent and 24.07 per cent of the net sown area respectively; whereas each of transplanted rice, big millet mixed with bulrush millet, maize and big millet has a smaller area. Total cropping of rice is about 39 per cent while total cropping of millets, alone or mixed with pulses, is about 37 per cent of the net cropped area. Sugarcane occupying 11.76 per cent has the largest proportion of the net cropped land among non-cereal crops, and fodder and vegetables are the small crops.

The extensive medium quality lands are left fallow during this season to be cultivated in the next rabi or kharif season.

LAND UTILIZATION IN THE RABI SEASON

The distribution of crops of the rabi season, 1962-63, and other uses of land are shown in Fig.68. Table XLIV gives a summary of the area occupied by each crop and its percentages to the total cultivated land and to the net cropped land in the village.

The Table XLIV shows that 47.28 per cent of the total land under cultivation is cropped in the rabi season, whereas 21.95 per cent is occupied by the continual kharif crops which include sugarcane and pulses (pigeon pea). A big proportion of the total land under plough, being 30.77 per cent, is left fallow in the rabi season.

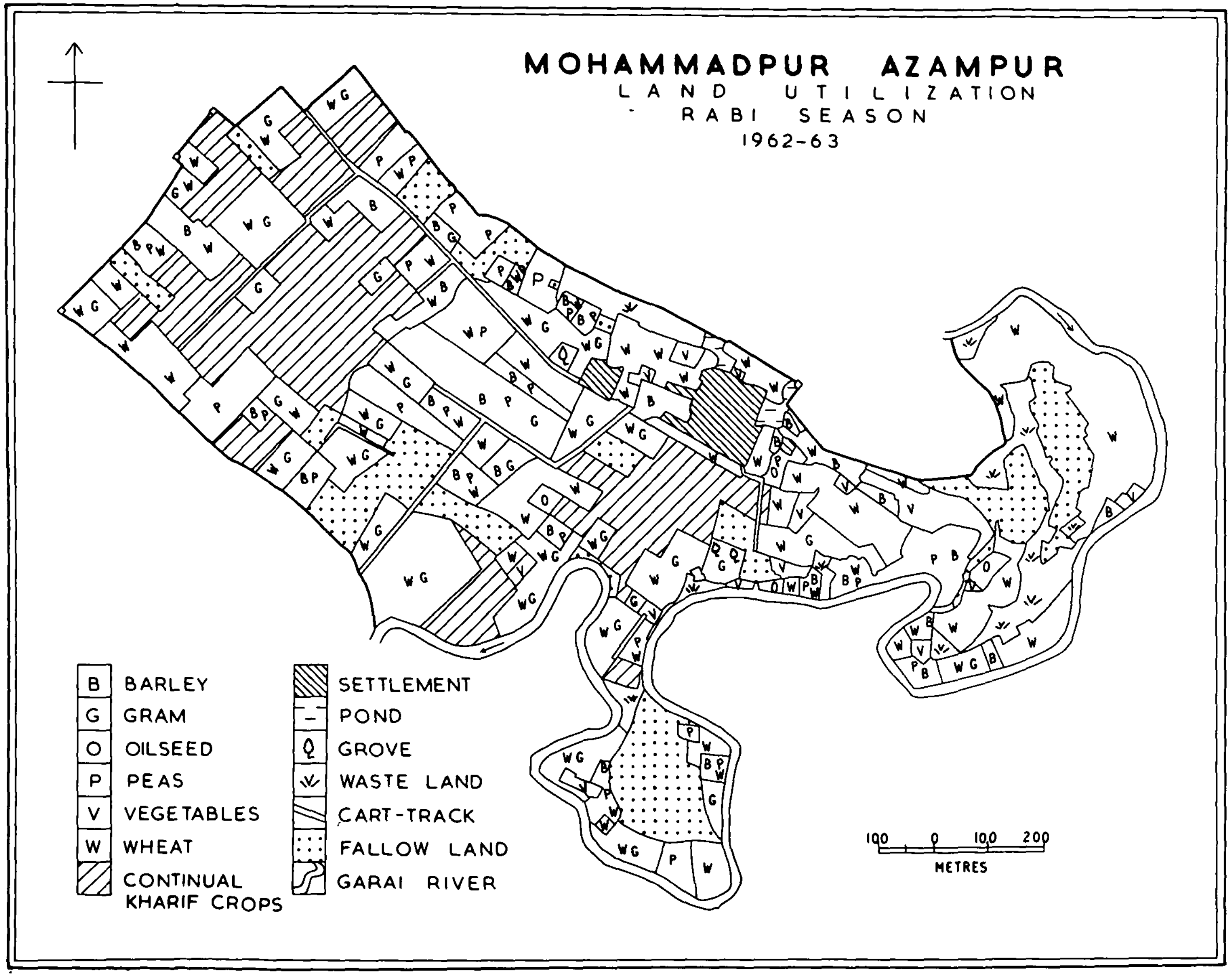

MOHAMMADPUR AZAMPUR
LAND UTILIZATION
RABI SEASON
1962-63
B BARLEY
G GRAM
O OILSEED
P PEAS
V VEGETABLES
W WHEAT
CONTINUAL KHARIF CROPS
SETTLEMENT
POND
GROVE
WASTE LAND
CART-TRACK
FALLOW LAND
GARAI RIVER
100 0 100 200
METRES

FIG. 68

Table XLIV

Total Cultivated Land ... 265.83 acres

Net Cropped Land in the Rabi Season ... 125.71 acres

Crops	Area in acres	Percentage to the total cultivated land	Percentage to the net cropped land	Total percentage to the total cultivated land	Total percentage to the net cropped land
Grain Crops				45.61	96.47
Wheat	31.35	11.79	24.94		
Wheat-gram (mixed)	49.00	18.43	38.98		
Wheat-barley (mixed)	17.48	6.58	13.90		
Peas	10.74	4.04	8.55		
Barley-peas-gram (mixed)	7.62	2.86	6.06		
Gram	2.82	1.06	2.24		
Barley	2.26	0.85	1.80		
Other Crops				1.67	3.53
Potato	3.22	1.21	2.56		
Oilseeds	1.22	0.46	0.97		
Fallow	81.79	30.77		30.77	
Continual Kharif Crops	58.33	21.95		21.95	
Total ...	265.83	100.00	100.00	100.00	100.00

Out of the net cropped land in the rabi season, 96.47 per cent is occupied by grain crops while 3.53 per cent is under non- cereal crops.

Among grain crops, wheat as a sole crop and also mixed with gram is the major crop. The crops of secondary importance are wheat-barley (mixed), peas, and barley-peas-gram (mixed). Individual crops of gram and barley occupy small areas.

The potato is the major non-cereal crop occupying 2.56 per cent of the net cropped land. The smallest percentage of crops is under oilseeds which include linseed, rapeseed and mustard seed.

There are no fodder crops or green manuring crops. The fodder requirement is wholly fulfilled by the straw obtained from grain crops of the rabi season.

DOUBLE CROPPED LAND

The area cropped twice during the year 1962-63, is shown in Fig.69. The total area under double cropping is 84.32 acres or 31.7 per cent of the total land under cultivation. All the double cropped area possesses the good quality (A) land.

The area under double cropping from year to year may have slight changes according to the changes in the amount of manures and irrigation applied to the cultivated land. The area under double cropping may well be increased with increase in manuring and irrigation.

ROTATION OF CROPS

The various crops are rotated from year to year in accordance with the types of ~~the~~ soils. The rotations are generally the same as adopted in the former villages of this chapter. However, rice crop is followed by wheat-gram while maize is followed by wheat, and millets by peas and barley, in general practice. The crops are continuously rotated in the good quality lands while in medium quality lands, the crops are rotated after fallowing for one or two seasons.

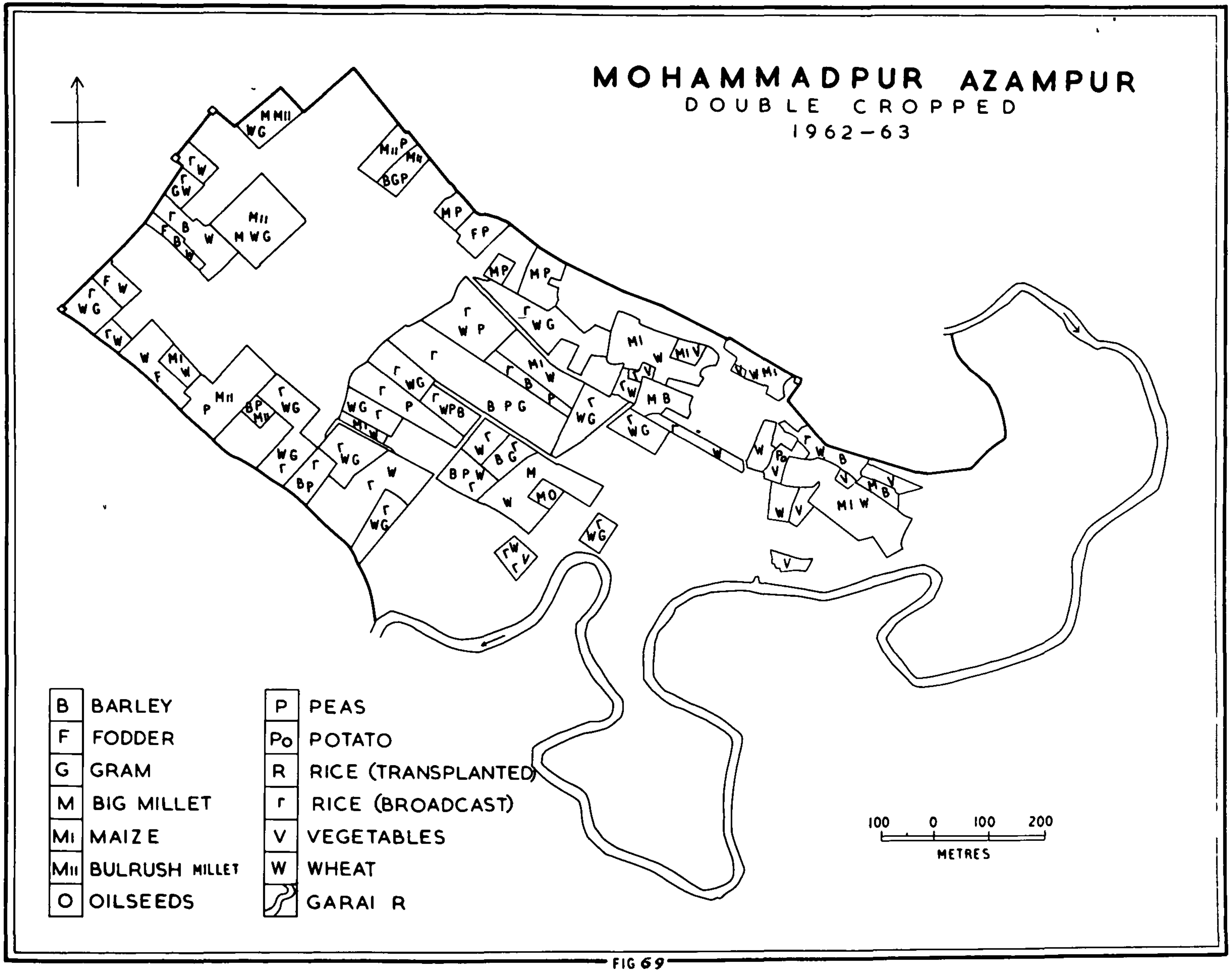

MOHAMMADPUR AZAMPUR
DOUBLE CROPPED
1962–63
B BARLEY
F FODDER
G GRAM
M BIG MILLET
Mi MAIZE
Mii BULRUSH MILLET
O OILSEEDS
P PEAS
Po POTATO
R RICE (TRANSPLANTED)
r RICE (BROADCAST)
V VEGETABLES
W WHEAT
GARAI R
100 0 100 200
METRES

FIG 69

LAND USE AND POPULATION

The total population which is dependent upon the produce of the village is 435. Table XLV shows the total acreage and the per capita share in the total village area, total cultivated land, net cropped land in the kharif as well as in the rabi season, gross cultivated land and the double cropped land.

Table XLV

Total Population of Village Mohammadpur Azampur ... 435
(Area in acres)

	Total area of the village	Total culti-vated land 1 available	Net cropped land in the kharif season	Net cropped land in the rabi season	Gross culti-vated land (both of kharif and rabi season)	Double cropped land
	291.95	265.83	162.81	125.71	288.52	84.32
Land per head of population	0.671	0.611	0.374	0.289	0.663	0.194

The above Table reveals that per capita share of total cultivated land is 0.611 acre, which decreases to 0.374 acre in the kharif season due to large fallowing. It further decreases to 0.289 acre in the rabi season due to fallowing and occupation of land by continual kharif crops during the rabi season.

The gross cultivated land of kharif and rabi seasons per head of population amounts to 0.663 acre. The actual amount of land which supports one person in the village is thus 0.663 acre.

On the other hand, the land which is cropped in both the kharif and rabi seasons provides per capita amount as 0.194 acre. Out of the total dependent population of the village, 96.5 per cent are primary rural and the rest are secondary rural; the former being cultivators and the latter being dependent upon the produce of the former through their ancillary services.

1. It includes 61.63 acres of cultivated land being under annual fallowing.

CALORIC INTAKE

The yields of various crops are different from village to village. Variations may occur from year to year in the light of changes in manuring conditions, irrigation facilities, rainfall variations, and in the differences of land preparations, weeding[1] and seeding. However, the average yields in the village have been considered and given in Table XLVI-A.

Table XLVI A

Crops	Yields per acre in kilograms
Rice (transplanted) unhusked	580
Rice (broadcast) unhusked	492
Big millet (when sown with pulses)	167
Pulses (pigeon pea) when sown with millets	112
Maize	597
Big millet (sown alone)	242
Bulrush millet (sown alone)	242
Canesugar (gur)	1,465
Wheat	505
Gram	672
Barley	506
Peas	746
Potato	1,866

On the basis of crop-yields, the total production of each crop in the village has been calculated and after deduction of export and addition of import and the amount stored for seed, the food available per head per day

1. It is locally called '<u>narai</u>' or '<u>nalai</u>'.

Table XLVI B

FOOD BALANCE SHEET

VILLAGE MOHAMMADPUR AZAMPUR

(in kilograms)

Population... 435 Year 1962-63

Commodity	Production	Total Production	Export	Import	Available Supply	Seed	Feed (Gross)	Extraction rate per cent	Feed (net)	Per head Consumption Kilograms per year	Grams per day	Calories per day
Rice (broadcast)	22494.2	22494.2	2249.4	-	20244.8	1279.2	18965.6	66 2/3	12643.7	29.066	79.6	284.2
Rice (transplanted)	10445.8	10445.8	933.0	-	9512.8	168.0	9344.8	66 2/3	6229.8	14.321	39.2	140.7
Big millet	2607.3	9955.5	1692.4	-	8263.1	196.3	8066.8	95	7663.5	17.617	48.3	165.7
Big millet(sown with pulses)	7348.2											
Bulrush millet	208.9	208.9	-	-	208.9	3.5	205.4	95	195.1	0.448	1.2	4.2
Big millet and Bulrush millet	4860.2	4860.2	1701.1	-	3159.1	72.9	3086.2	95	2932.1	6.736	18.4	63.5
Pulses (sown with millets)	4460.9	4460.9	-	-	4460.9	55.4	4405.5	95	4185.2	9.621	26.4	90.5
Maize	7492.4	7492.4	-	-	7492.4	93.6	7398.8	89	6584.9	15.138	41.5	147.7
Sugar (gur)	28040.1	28040.1	14020.0	-	14020.1	1837.4	12182.7		12182.7	28.006	76.7	269.2
Wheat	15831.8	15831.8	-	-	15831.8	1724.3	14107.5	90	12696.8	29.188	79.9	266.8
Gram	1895.0	1895.0	-	-	1895.0	155.1	1739.9	95	1652.9	3.799	10.4	37.2
Barley	1143.6	1143.6	-	-	1143.6	116.4	1027.2	70	719.0	1.653	4.5	14.9
Peas	8012.0	8012.0	-	-	8012.0	590.7	7421.3	95	7050.2	16.207	44.4	153.6
Wheat-gram	28420.0	28420.0	5684.0	-	2273.6	2695.0	20041.0	92	18437.7	42.386	116.1	401.7
Wheat-barley	2827.4	2827.4	-	-	2827.4	926.4	1901.0	80	1520.8	3.496	9.6	31.9
Barley-peas-gram	1663.7	1663.7	-	-	1663.7	411.5	1252.2	86 2/3	1085.2	2.495	6.8	23.5
Potato	6008.5	6008.5	-	1492.2	7510.7	534.5	6976.2	85	5929.8	13.632	37.3	26.1
Total												2235.2

has been worked out in Table XLVI-B. The daily caloric intake per head of population has then been ascertained from the net food available for consumption.

The Table reveals that instead of considerable export of some crop produce the per capita daily intake of calories is 2,235 which shows an adequate diet. Greater supplier of calories in the village are in order wheat mixed with gram, rice (broadcast), canesugar (gur), wheat, big millet, peas, maize and rice (transplanted).

POTENTIAL PRODUCTION UNIT

On the basis of crop yields, the different types of agricultural lands have been assessed by the writer to evaluate their potential productivity. Table XLVII shows the average yield per acre, relative productivity ratings of different types of cultivated lands and total numbers of Potential Production Units, as computed for each of them.

Table XLVII

Average Yield per acre of Normal Standard Farmland in the Village : 589 kilogram or 1 P.P.U.

Type of Land	Area in acres	Average yield per acre in kilograms	Productivity rating per acre	Number of P.P.U.
A	103.46	726	1.23	127.26
BI	53.81	589	1.00	53.81
BII	108.51	450	0.76	82.51
C	13.16	0	0	0
Total ...	278.99			263.58

The Table XLVII shows that the Potential Production Units are less than the culturable area. The reasons of this loss are firstly that a considerable area of poor quality (C) lands which have no productivity and no Potential Production Unit is also included in the area considered; and secondly the largest amount of land is that of BII quality which has lower productivity rating per acre than the normal standard farmland.

The good quality (A) lands possess the second largest area which is equal to 1.23 P.P.U. per acre resulting in its largest contribution to the total number of P.P.U. The BI quality lands possess the normal standard productivity which is equal to 1 P.P.U. per acre.

It is, however, established that the potential productivity of the cultivated land, particularly of the medium quality lands, may well be increased to a considerable extent if the provisions of manuring and irrigation are sufficiently enlarged. A good proportion of BI lands may thus attain the productivity value of good quality (A) lands; similarly the productivity of BII quality lands may be raised to that of BI lands.

LAND UTILIZATION IN PAINDAPUR

LOCATION

The village Paindapur lies in the Tahsil Tilhar and is located at 79°51'20" E. long. and 28°5'45" N. lat. Being situated in vast level plain, the village possesses fertile loamy soil. The village is 1.4 kilometres southwest of Nigohi town. On its boundaries are the village Deeng in the west, Piparia Khushali in the southwest, south and southeast, and Hamzapur in the north and northeast (fig.70). The village site is nearly in the middle of the southwest boundary.

The village lacks easy accessibilities from its surrounding places. However, there are some cart-tracks which provide connecting links between different villages. During the rainy season, the cart-tracks become very difficult to use.

CLIMATE

No climatic data is recorded in the village. However, the rainfall statistics maintained at the Tahsil headquarters may be taken as approximate for rainfall conditions in the village, since it lies in the vicinity of the Tahsil headquarters. The rainfalls are given in Tables XLVIII and XLIX.

Table XLVIII

Rainfall in the Kharif Season,1962 (Tilhar)

	MONTHS					
	June	July	Aug.	Sept.	Oct.	Total
Rainfall in millimetres in the kharif season,1962	-	127.0	353.8	200.7	-	681.5
Rainy days in the kharif, 1962	-	6	14	6	-	
Average rainfall in millimetres	94.7	302.9	283.4	169.7	40.8	891.5

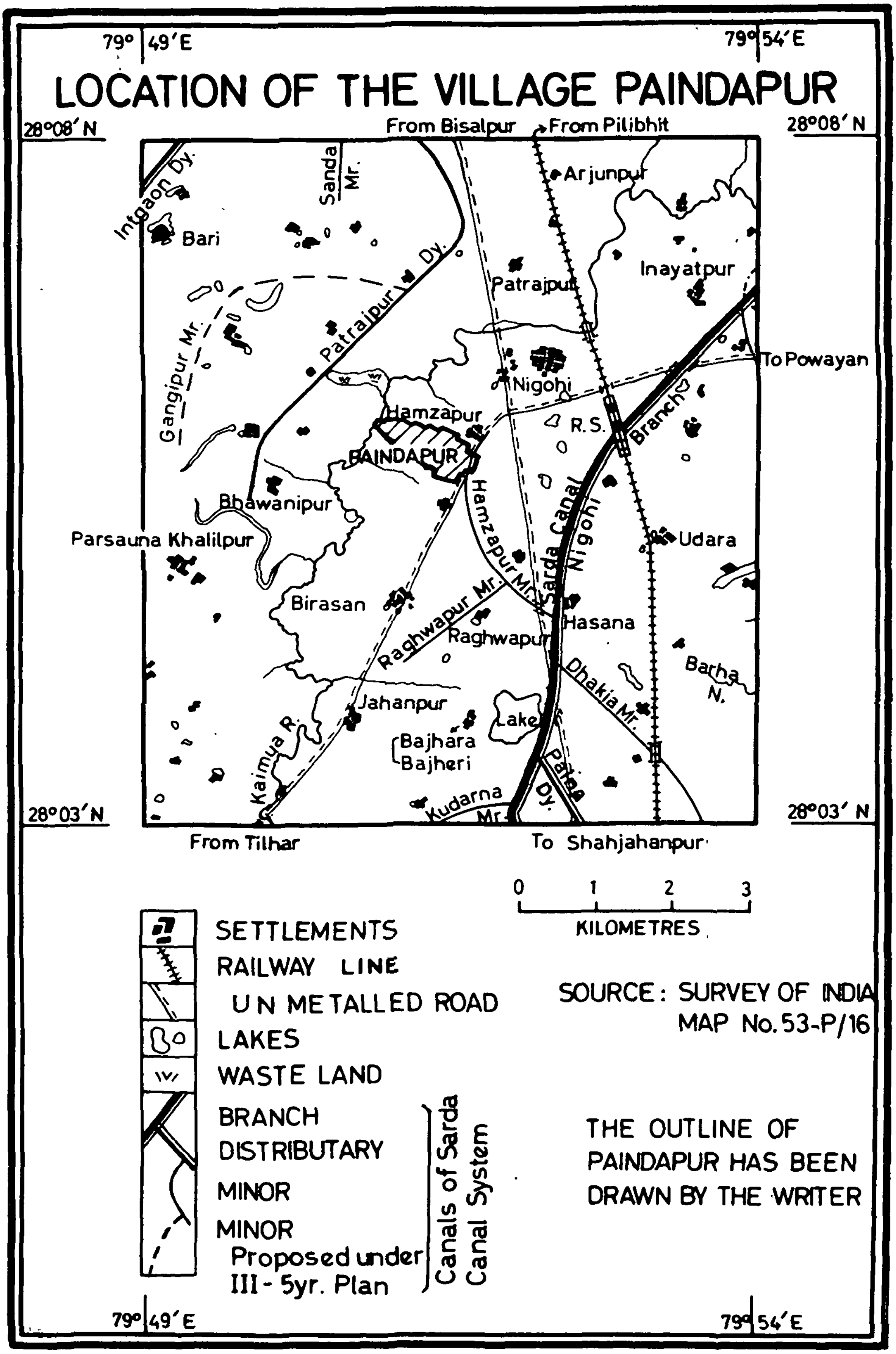

LOCATION OF THE VILLAGE PAINDAPUR
79° 49′E
79° 54′E
28°08′ N
28°08′ N
28°03′ N
28°03′ N
From Bisalpur
From Pilibhit
Intgaon Dy.
Sanda Mr.
Arjunpur
Bari
Inayatpur
Patrajpur Dy.
Patrajpur
Gangipur Mr.
To Powayan
Nigohi
Hamzapur
R.S.
Branch
PAINDAPUR
Hamzapur Mr.
Sarda Canal
Nigohi
Bhawanipur
Parsauna Khalilpur
Udara
Birasan
Raghwapur Mr.
Hasana
Raghwapur
Dhakia Mr.
Barha N.
Jahanpur
Lake
Bajhara
Bajheri
Kaimua R.
Patna Dy.
Kudarna Mr.
From Tilhar
To Shahjahanpur
0 1 2 3
KILOMETRES
SETTLEMENTS
RAILWAY LINE
UN METALLED ROAD
LAKES
WASTE LAND
BRANCH
DISTRIBUTARY
MINOR
MINOR Proposed under III - 5yr. Plan
Canals of Sarda Canal System
SOURCE: SURVEY OF INDIA MAP No. 53-P/16
THE OUTLINE OF PAINDAPUR HAS BEEN DRAWN BY THE WRITER

FIG.70

The above Table reveals that the total rainfall of the season is quite scanty being lower than the seasons' average. It is due to the fact that June, which has average rainfall as 94.7 millimetres and October whose average is 40.8 millimetres, have been totally rainless. The rainfall in July, though below the monthly average, allowed late sowing of kharif crops. The abundant rainfall in August, sufficiently greater than the average, however, proved to be a boon for rice crops. The deficiency of seasonal rainfall, particularly in June and July, caused late sowing of kharif crops, and resulted in deterioration of the quality as well as yield of the crops.

Table XLIX

Rainfall in the Rabi Season, 1962-63 (Tilhar)

	MONTHS					
	Nov.	Dec.	Jan.	Feb.	March	Total
Rainfall in the Rabi season, 1962-63	-	-	29.2	10.2	12.2	51.6
Rainy days in Rabi, 1962-63	-	-	2	2	2	6
Average rainfall in millimetres	2.5	7.8	18.6	21.2	13.6	63.6

The Table XLIX shows that November and December experienced complete failure of rainfall while January received a good amount of rainfall. February got deficient rainfall being less than half the average. However, sufficient rainfall in January proved to be very beneficial for wheat, gram, peas and barley. Deficiency of rainfall during the month of March, when the crops ripen, is not injurious and as such the rabi crops of the village were not subjected to any loss at the time of maturity. Failure or deficiency of rainfall in December is not as much injurious as that in January, because December is the sowing period whereas January is the period of seeds' germination.

LAND CLASSIFICATION

The fields of the village have been classified in accordance with the fertility and productivity of the soils. Three classes of soils viz,, the good quality, medium quality and poor quality, are recognised. Medium quality lands have further been sub-divided into BI (clayey loam) and BII (sandy loam) lands. The good quality lands are classified as A and the poor quality land as C (Fig.71).

The good quality (A) lands cover 35.08 acres while the area of BI quality lands is 5.12 acres and that of BII quality lands it is 43.75 acres. The area of poor quality (C) lands is only 2.43 acres. The good quality (A) lands include the fields which are cropped twice a year and also the lands cropped with sugarcane. The BI quality lands have texturally clayey loam soil. The BII type of lands, possessing the large area, have sandy loam soil. The BI lands are usually devoted to rice crops in <u>kharif</u> and gram, alone or mixed with other crops, in the <u>rabi</u> season. The BII lands are generally sown with millets, pulses and non-cereal crops in kharif, and with wheat, peas, barley, lentil and other non-cereal crops in the rabi season.

IRRIGATION

The cultivated lands include both irrigated and unirrigated areas during 1962-63. The irrigated lands ~~are~~ depicted in Fig.72 which shows lands irrigated in the kharif as well as in the rabi season. The irrigated area in the kharif season is relatively less than that in the rabi season. The sugarcane crop is irrigated in the kharif ~~due~~ owing to its frequent water requirements while in the rabi season, nearly all crops require watering, which becomes

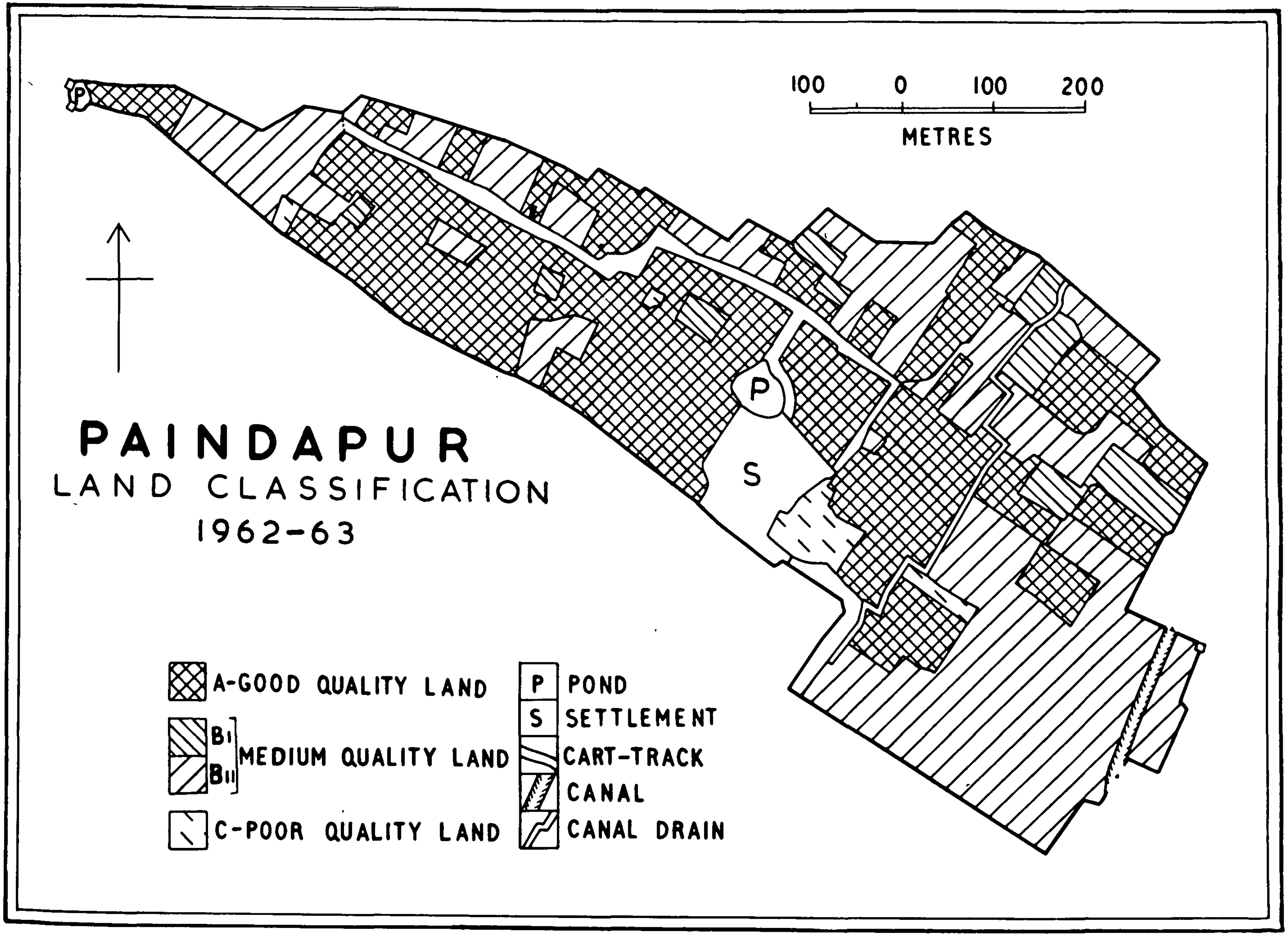

PAINDAPUR
LAND CLASSIFICATION
1962-63
100 0 100 200
METRES
P
S
A-GOOD QUALITY LAND
B I
B II
MEDIUM QUALITY LAND
C-POOR QUALITY LAND
P POND
S SETTLEMENT
CART-TRACK
CANAL
CANAL DRAIN

FIG. 71

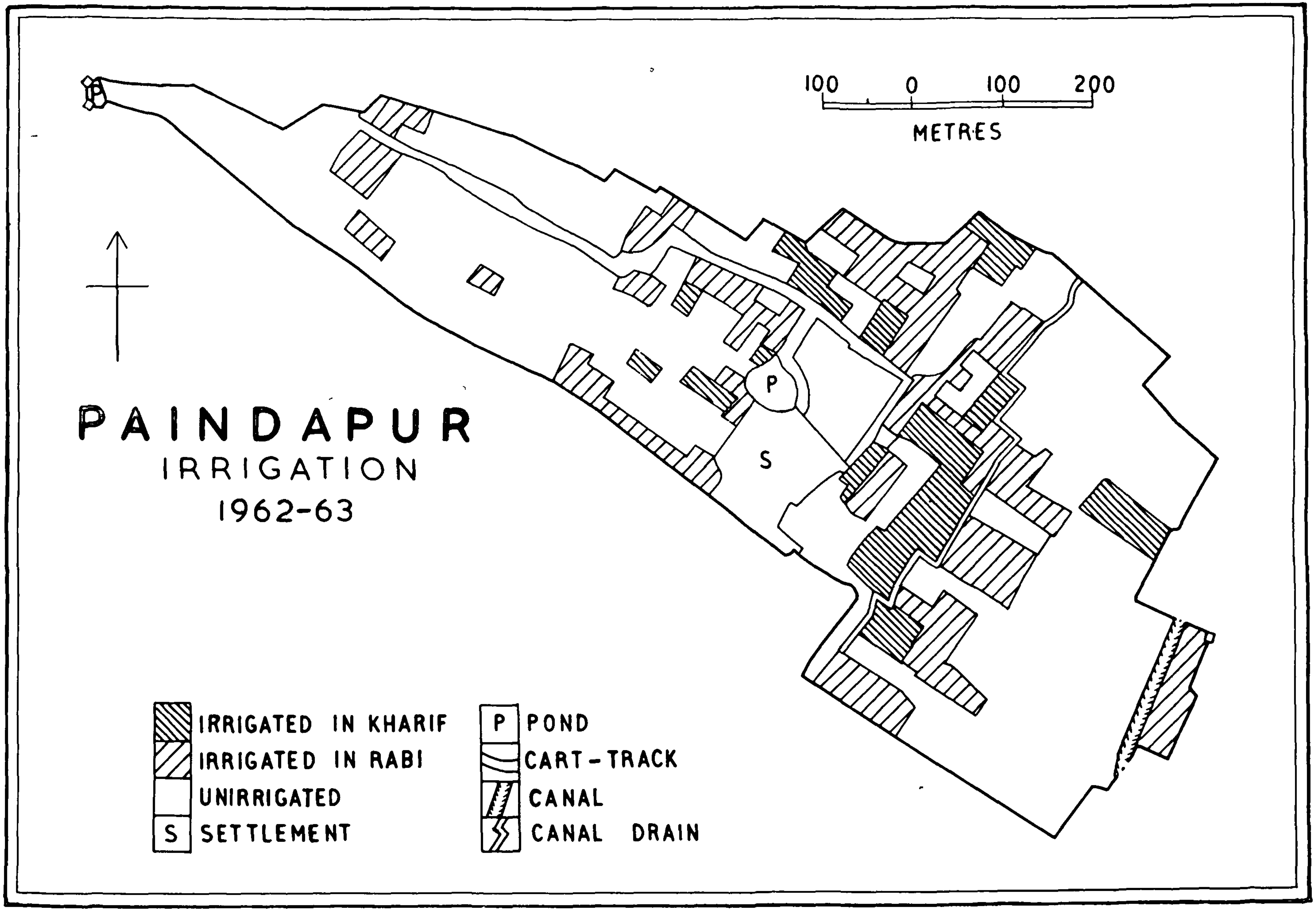

100 0 100 200
METRES
PAINDAPUR
IRRIGATION
1962-63
IRRIGATED IN KHARIF
IRRIGATED IN RABI
UNIRRIGATED
S SETTLEMENT
P POND
CART-TRACK
CANAL
CANAL DRAIN
P
S

FIG. 72

necessary when winter rainfall fails or remains deficient, particularly for wheat, gram and potato crops. The deficiency and precariousness of rainfall in the rabi season is seen in Table XLIX.

The main sources of irrigation are canal and the ponds; only a few non-masonary wells in the western part of the village are also used. The rainfall figures show that the total rainfall of the period from June to October, in the year of inquiry is 681.5 millimetres being far below the seasonal average. Therefore irrigation to sugarcane crop becomes intensely necessary. The eastern part of the village depends to a large extent on canal irrigation since Hamzapur minor canal of Nigohi Branch passes through it.

In the rabi season, absence of rainfall in November and December and deficiency in February adversely affect the growth of crops unless the fields receive irrigation water. Whenever the irrigation facilities are available, the rabi crops grow well, but absence of irrigation-facilities leads to a poor harvest. Wheat, gram and potato are generally irrigated while other rabi crops are occasionally irrigated. It has been found that cost of irrigation by canal is rupees 6.00 per acre for watering fields once while in the case of pond-irrigation the cost for one watering is rupees 5.75 per acre.

LAND UTILIZATION

The lands, put to different uses during the year 1962-63, are shown in Fig.73 and Table L gives the details of acreage and percentage under each item.

The Table L indicates that 86.98 per cent of the total area of the village is under cultivation while the remaining is given to non-agricultural uses. There are no meadows for livestock except the waste land with bushes. The settlement and the area under cart-track are each 3.40 per cent while only 0.75 per cent is under water(pond)and 1.61 percent is occupied by canal.

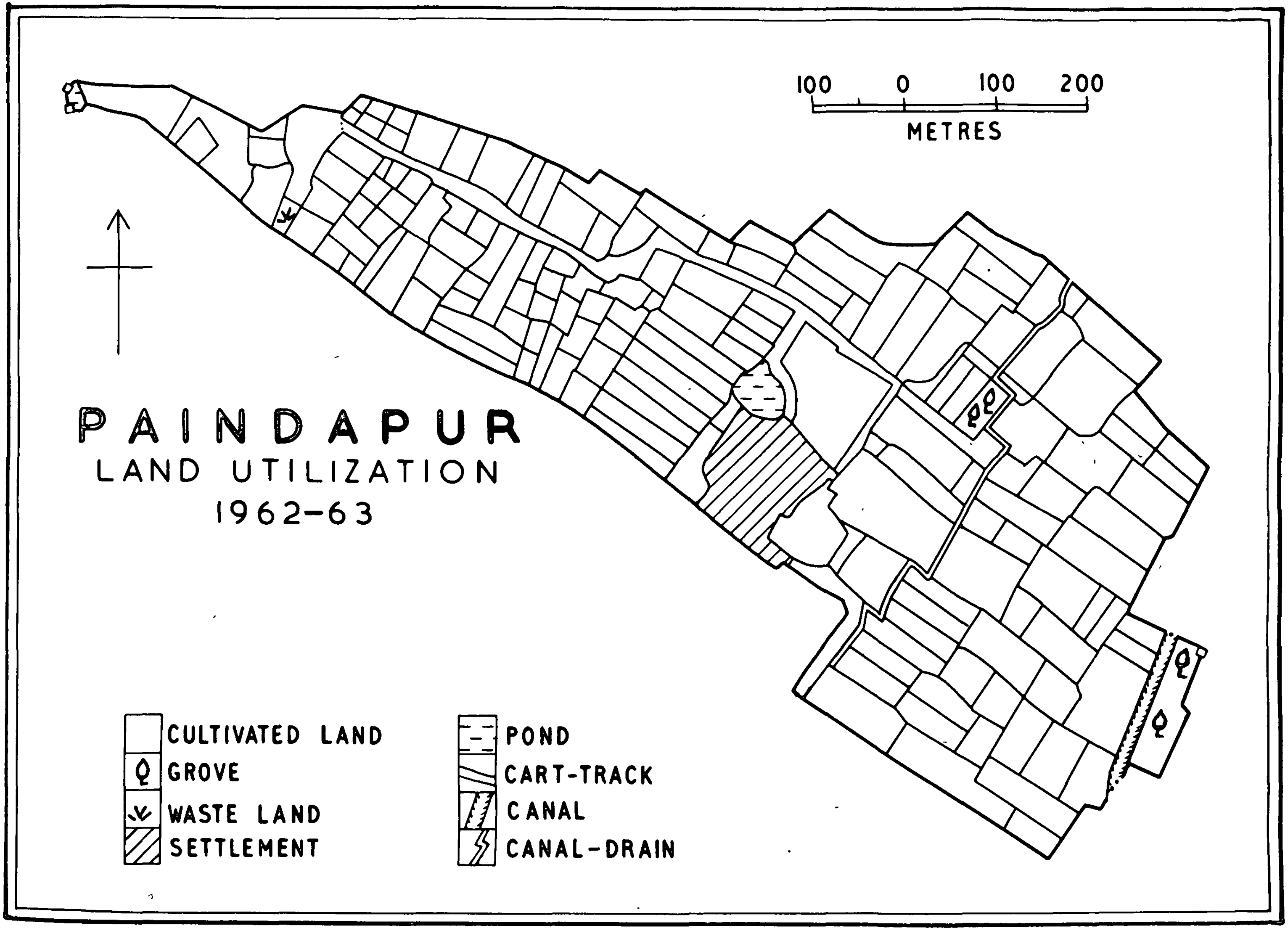

PAINDAPUR
LAND UTILIZATION
1962–63
100 0 100 200
METRES
CULTIVATED LAND
GROVE
WASTE LAND
SETTLEMENT
POND
CART-TRACK
CANAL
CANAL-DRAIN

FIG. 73

Table L

Total Area of the Village ... 99.31 acres

Use of Land	Area in acres	Percentage to the total area
Cultivated land	86.38	86.98
Grove	1.36	1.37
Settlement	3.40	3.42
Cart-track	3.40	3.42
Pond	0.74	0.75
Canal occupied area	1.60	1.61
Waste land	2.43	2.45
Total ...	99.31	100.00

A good proportion of the cultivated fields is rectangular in shape having permanent boundaries. One of the common practices here is that some cultivators divide a big field into two or three smaller ones in order to produce two or three different crops. These smaller divisions are locally known as kiaris and are purely temporary.

LAND UTILIZATION IN THE KHARIF SEASON

The distribution of village land among various crops of the kharif season, 1962, and other non-agricultural uses of land are depicted in Fig.74. A summary of the areas under different kharif crops and the percentage of each crop to the total land under plough and to the net cropped land is given in Table LI.

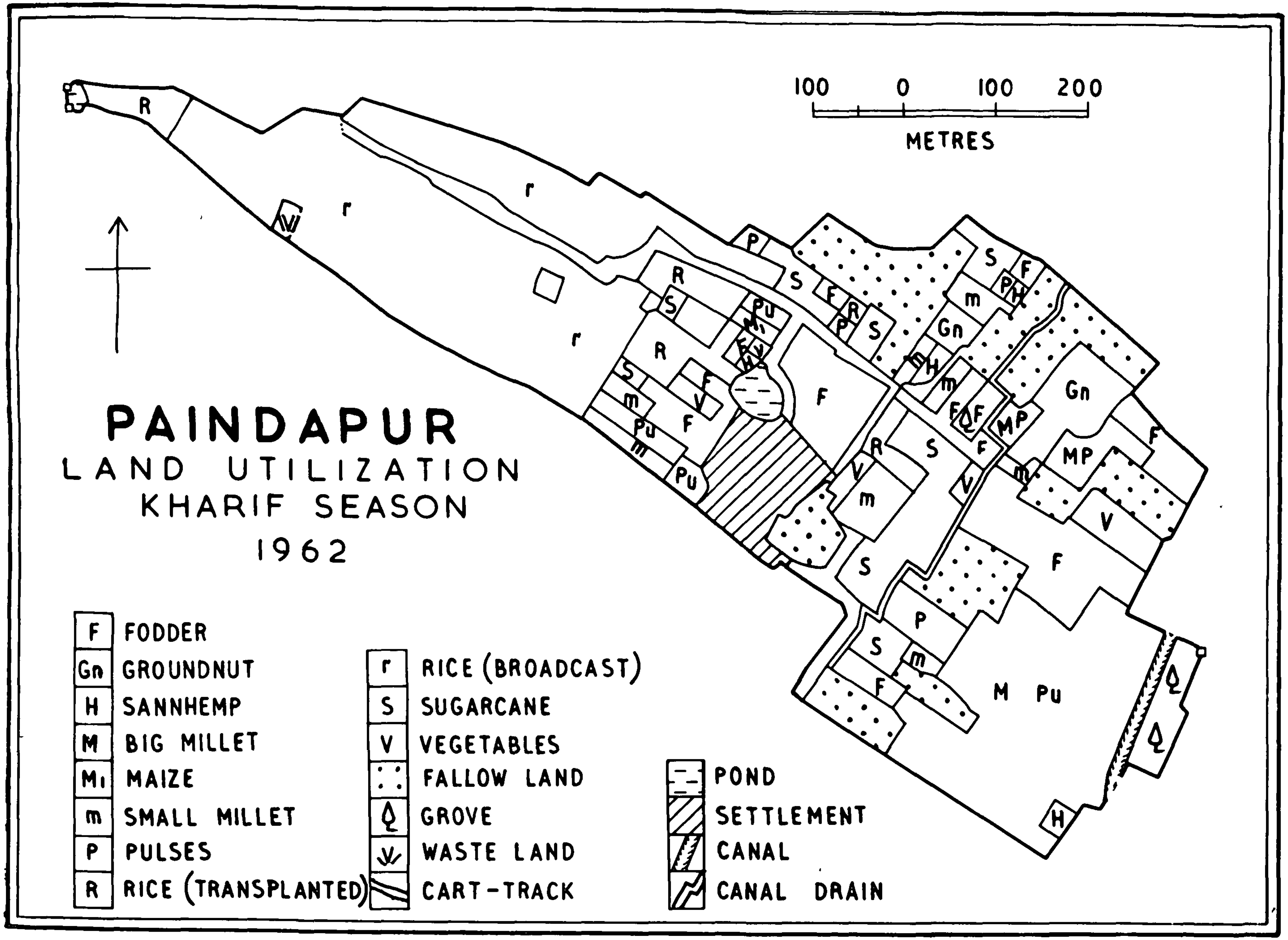

PAINDAPUR
LAND UTILIZATION
KHARIF SEASON
1962
100 0 100 200
METRES
F FODDER
Gn GROUNDNUT
H SANNHEMP
M BIG MILLET
Mi MAIZE
m SMALL MILLET
P PULSES
R RICE (TRANSPLANTED)
r RICE (BROADCAST)
S SUGARCANE
V VEGETABLES
FALLOW LAND
GROVE
WASTE LAND
CART-TRACK
POND
SETTLEMENT
CANAL
CANAL DRAIN

FIG. 74

Table LI

Total Cultivated Land ... 86.38 acres

Net Cropped Land in the Kharif Season ... 70.30 acres

Crops	Area in acres	Percentage to total cultivated land.	Percentage to net cropped land	Total percentage to the total cultivated land	Total percentage to the net cropped land
Grain Crops				44.36	54.51
Rice (transplanted)	24.76	28.66	35.22		
Rice (broadcast)	2.65	3.07	3.77		
Big millet and pulses (pigeon pea)	6.26	7.25	8.91		
Small millet	2.35	2.72	3.34		
Pulses (pigeon pea)	2.30	2.66	3.27		
Other Crops				37.02	45.49
Fodder	17.01	19.69	24.20		
Sugarcane	6.17	7.14	8.78		
Fruit	6.00	6.95	8.53		
Groundnuts	1.83	2.12	2.60		
Sannhemp	0.77	0.89	1.10		
Vegetables	0.20	0.23	0.28		
Fallow	16.08	18.62		18.62	
Total ...	86.38	100.00	100.00	100.00	100.00

The above Table shows that 44.36 per cent of the total cultivated land is occupied by grain crops and 37.02 per cent is under non-cereal crops, while 18.62 per cent is fallow land in the kharif season. The 54.51 per cent of the net sown area is under cereal crops.

Among cereal crops, transplanted rice occupies the largest area, 35.22 per cent of the net sown area, while big millet mixed with pulses has second largest proportion, being 8.91 per cent and the other grain crops have each smaller percentages.

Among other crops, fodder cultivation, being 24.20 per cent of the net cropped land is the largest, while sugarcane and fruits amount to 8.78 and 8.53 per cent of net cropped land respectively.

The sufficient water supply from canal is useful for the largest proportion of transplanted rice crop and sufficient production of fodder crop, besides low rainfall in the kharif season (Table LI). Among all edible crops, vegetables have the least area in the village.

LAND UTILIZATION IN THE RABI SEASON

The crops produced in the rabi season, 1962-63, and other uses of land in the village are shown in Fig.75. Table LII gives a summary of each cereal and non-cereal crop of the rabi season. It also gives the percentages of each crop to the total cultivated land and to the net cropped land in the rabi season.

It will be seen from Table LII that 95.25 per cent of the net cropped land in the rabi season is devoted to grain crops and only 4.75 per cent is under other crops. The 52.08 per cent of the total cultivated land is cropped in the rabi season, and 14.39 per cent is occupied by the continual kharif crops, whereas 33.53 per cent is under fallowing in the rabi season.

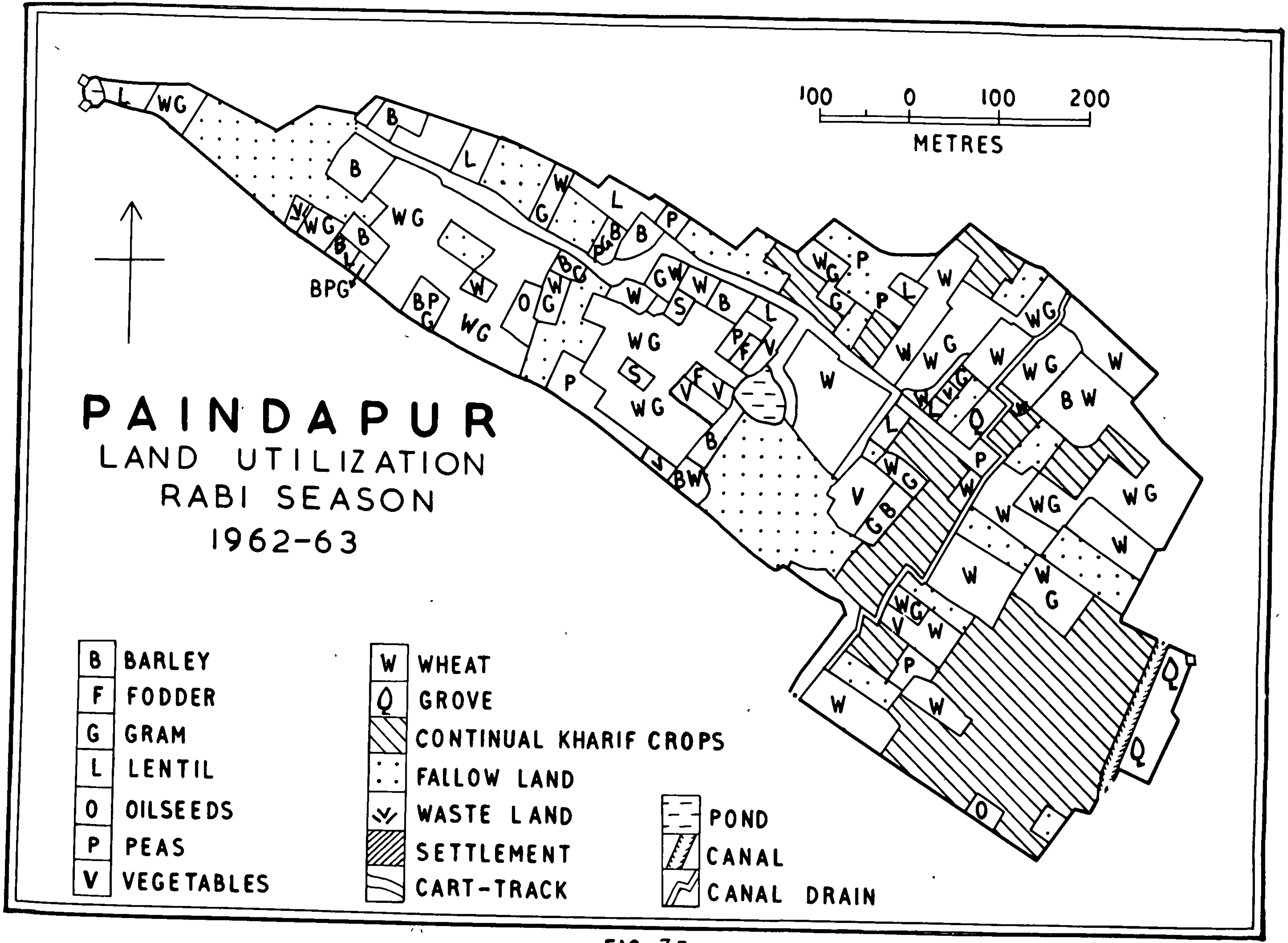

PAINDAPUR
LAND UTILIZATION
RABI SEASON
1962-63
100 0 100 200
METRES
B BARLEY
F FODDER
G GRAM
L LENTIL
O OILSEEDS
P PEAS
V VEGETABLES
W WHEAT
GROVE
CONTINUAL KHARIF CROPS
FALLOW LAND
WASTE LAND
SETTLEMENT
CART-TRACK
POND
CANAL
CANAL DRAIN

FIG. 75

Table LII

Total Cultivated Land ... 86.38 acres

Net Cropped Land in the Rabi Season ... 44.99 acres

Crops	Area in acres	Percentage to the total cultivated land	Percentage to the net cropped land	Total percentage to the total cultivated land	Total percentage to the net cropped land
Grain Crops				49.60	95.25
Wheat-gram (mixed)	22.79	26.38	50.65		
Wheat	8.86	10.26	19.69		
Peas	3.50	4.05	7.80		
Barley	3.34	3.87	7.42		
Lentil	1.54	1.78	3.42		
Gram	1.53	1.77	3.41		
Barley-peas-gram (mixed)	1.29	1.49	2.86		
Other Crops				2.48	4.75
Potato	1.63	1.89	3.62		
Oilseeds	0.51	0.59	1.13		
Continual Kharif Crops	12.43	14.39		14.39	
Fallow	28.96	33.53		33.53	
Total ...	86.38	100.00	100.00	100.00	100.00

Among the cereal crops, wheat-gram (mixed) crop occupies the largest area being 50.65 per cent of the net cropped land in the season; wheat is the second largest being 19.69 per cent.

Among other crops, potato is the largest occupying 3.62 per cent of the net sown area. There are no crops of fodder or green manure in the rabi season. A good proportion of green crop of peas is used as fodder.

The continual kharif crops include pulses (pigeon pea) and sugarcane, which are harvested during the rabi season.

DOUBLE CROPPED LAND

The double cropped land, which is cropped in the kharif as well as the rabi season, 1962-63, is shown in Fig. 76. The area under double cropping in the village during the year is 28.91 acres, which comes to about 33.5 per cent of the total cultivated land in the village. All the double cropped land possesses good quality (A) lands. The area under double cropping does not remain the same always, it may increase or decrease according to sufficient or inadequate manuring and/ or irrigation applied to the land. A little change in its area from year to year, therefore, is usual. Thus the double cropped area may be increased well through sufficient and regular manuring and irrigation.

The double cropped land per head comes to only 0.133 acre in the village.

ROTATION OF CROPS

The rotation of crops in the village may have slight differences from those in other villages. Variation may also occur from year to year. The good quality lands are generally cropped in successive seasons for years; whereas the medium quality lands are firstly put to fallowing and then they are cropped. However, the usual rotation of crops are as follows:

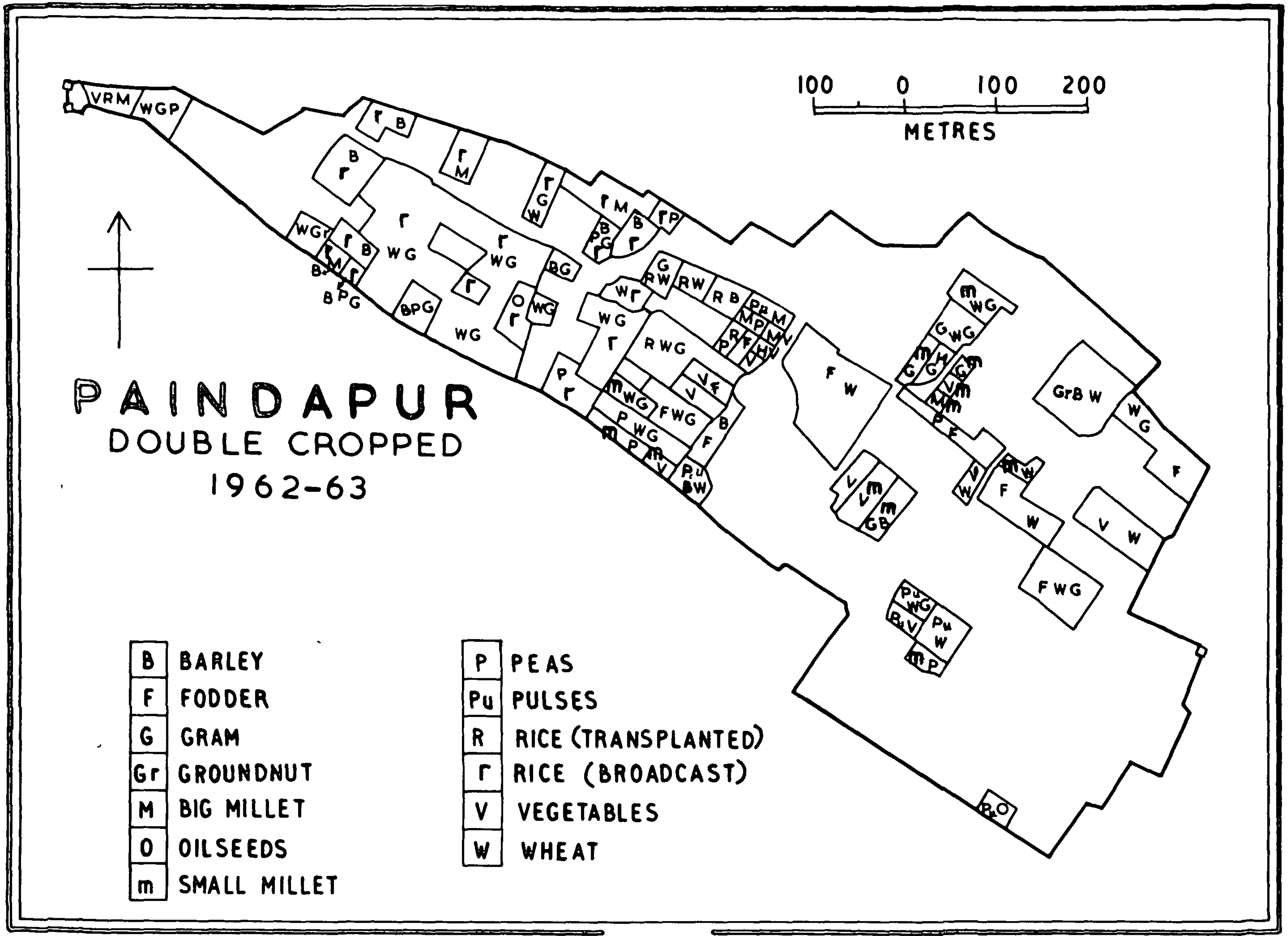

PAINDAPUR
DOUBLE CROPPED
1962-63
100 0 100 200
METRES
B BARLEY
F FODDER
G GRAM
Gr GROUNDNUT
M BIG MILLET
O OILSEEDS
m SMALL MILLET
P PEAS
Pu PULSES
R RICE (TRANSPLANTED)
r RICE (BROADCAST)
V VEGETABLES
W WHEAT

FIG. 76

Crop year	Kharif season	Rabi season
First year	Rice(transplanted)/sugarcane	wheat-gram/sugarcane (contd.)
Second year	Rice(transplanted)/sugarcane	wheat/wheat-gram/sugarcane(contd.)
Third year	Millets/maize/millets with pulses	wheat/wheat-barley/wheat-peas

The above crop rotation is related to the good quality (A) lands. But there is a little difference of crop rotation in the medium quality BI lands.

Crop year	Kharif season	Rabi season
First year	Rice (transplanted or broadcast)	Wheat-gram
Second year	Rice (broadcast)	Gram/wheat-gram/peas-gram
Third year	Rice (broadcast)/millets/fodder	Barley-peas/wheat-gram/ barley-gram

The crop rotation in the above type of lands mainly consists of large production of rice and gram, alone or mixed with other cereals. The crop rotation in the BII type of lands is quite different from that of BI lands. The rotation in BII lands is as follows:

Crop year	Kharif season	Rabi season
First year	Millets/millets with pulses/ rice	Wheat/wheat-barley/wheat-gram
Second year	Maize/millets/fodder	Wheat/wheat-peas
Third year	Pulses with maize or millets/ pulses	Wheat-barley/barley/peas-barley/kharif pulses (Contd.)

There is predominant production of millets, maize, pulses, wheat, lentil, barley and peas in BII lands; however, broadcast rice is also grown in it to some extent.

The deficiency of rainfall in the <u>kharif</u> as well as in the <u>rabi</u> season (Tables XLVIII and XLIX) is adequately met with irrigation, particularly from the canal. It is why that out of 54.51 per cent share of all grain crops in the net kharif cropped area, the crop of rice alone occupies 38.99 per cent. Similarly in the rabi season, 95.25 per cent of the net cropped land is under cereal crops in which 70.34 per cent is shared by crops of wheat and wheat-gram (mixed).

LAND USE AND POPULATION

The total population in the village is 189 which is dependent upon the produce of the village. Table LIII shows the total area and the per capita share in each of the total cultivated land, net cropped land in the kharif and rabi seasons, gross cultivated land and the double cropped land.

Table LIII

The Population of Village Paindapur .. 189
(Area in acres)

	Total area of the village	Total cultivated land available	Net cropped land in the kharif season	Net cropped land in the rabi season	Gross cultivated land (both of kharif and rabi)	Double cropped land
	99.31	86.38	70.30	44.99	115.29	28.91
Land per head of population	0.525	0.457	0.372	0.238	0.610	0.153

The Table indicates that per capita share of total cultivated land is 0.457 acre, which decreases to 0.372 acre in the kharif season owing to fallowing. The land per capita further decreases in the rabi season to 0.238 acre on account of fallowing and the continual kharif crops occupying 14.39 per cent of the total cultivated land during the rabi season.

The gross cultivated land —the total of kharif and rabi— amounts to 0.610 acre per head of population. The actual amount of land which supports one person in the village population is thus 0.610 acre. Out of the total population, 97 per cent are primary rural or actual cultivators and the rest are secondary rural who are dependent upon the produce of the cultivating class through their ancillary services to the former; they include tailor and carpenters.

CALORIC INTAKE

The yield of a certain crop may slightly vary from year to year, and also from field to field. It is because the differences of kind and amount of manuring, variations of rainfall, availability of irrigation, and the differences of good or poor preparation of soils and those of weeding and seeding affect considerably upon yields of crops.

However, Table LIV-A gives the usual yield of various crops grown in the kharif and rabi season in the village. Cropping of rice gives better returns in BI lands than BII lands. Wheat crop gives better yields in A and BII lands than the BI lands. The BI lands give poor yields of potato as compared to that of BII lands. In the BI quality lands, the crop of gram flourishes well than in BII quality lands. The medium quality lands are more prone to variations in crop-yields than the good quality lands.

Table LIV A

Crops	Yield per acre (in kilograms)
Rice (transplanted)[1] unhusked	826
Rice (broadcast) unhusked	746
Big millet (sown with pulses)	169
Pulses (sown with millets)	114
Pulses (sown alone)	158
Small millet	176
Canesugar (Gur)	1,679
Wheat	560
Barley	597
Peas	821
Gram	709
Lentil	224
Potato	1,866

It will be seen from Table LIV-B that half of the sugarcane or '<u>gur</u>' produce and a small amount of rice is exported from the village. The per capita daily intake of calories from all the land-produce is 2,167 which shows an adequate diet in the village. The largest caloric supply of food is from rice and wheat-gram (mixed). The sugar (<u>gur</u>), wheat and peas are also big crops to provide considerable amount of calories; each of the other crops provides less than 100 calories.

1. The good production of rice is due to good facilities of irrigation, particularly by canal.

Table LIV B

FOOD BALANCE SHEET

VILLAGE PAINDAPUR

(in kilograms)

Population... 189 Year 1962-63

Commodity	Production	Total Production	Export	Import	Available Supply	Seed	Feed (Gross)	Extraction rate per cent	Feed (net)	Per head Consumption		
										Kilograms per year	Grams per day	Calories per day
Rice (transplanted)	20451.8	20451.8	1980.9	-	18470.9	231.0	18239.9	66 2/3	12159.9	64.338	176.3	632.9
Rice (broadcast)	1976.9	1976.9	-	-	1976.9	72.7	1904.7	66 2/3	1269.5	6.717	18.4	65.7
Big millet (sown with pulses)	1170.6	1170.6	-	-	1170.6	24.6	1146.0	95	1086.7	5.749	15.8	54.2
Pulses (sown with millets)	713.6	1077.0	-	-	1077.0	15.0	1062.0	95	1008.9	5.338	14.6	50.1
Pulses (sown alone)	363.4											
Small millet	413.6	413.6	-	-	413.6	10.9	402.7	95	382.6	2.024	5.5	18.7
Sugar (gur)	10359.4	10359.4	5179.7	-	5179.7	598.5	4581.2		4581.2	24.239	66.4	233.1
Wheat	3836.0	3836.0	-	-	3836.0	487.3	3348.7	90	3013.8	15.946	43.7	145.9
Wheat-gram	14357.7	14357.7	-	-	14357.7	1253.4	13104.3	92	12055.9	63.787	174.7	604.4
Peas	2873.5	2873.5	-	-	2873.5	19.2	2854.3	95	2711.6	14.347	39.3	135.9
Barley	1993.9	1993.9	-	-	1993.9	170.3	1823.6	70	1276.5	6.754	18.8	62.4
Gram	1084.8	1084.8	-	-	1084.8	84.2	1000.6	95	950.6	5.029	13.8	49.4
Barley-peas-gram	903.0	903.0	-	-	903.0	69.7	833.3	86 2/3	722.2	3.821	10.4	35.9
Lentil	344.9	344.9	-	-	344.9	8.6	336.3	95	319.5	1.690	4.3	14.9
Potato	3041.6	3041.6	-	4562.3	7603.9	270.6	7333.3	85	6233.3	32.980	90.4	63.3
Total												2166.8

POTENTIAL PRODUCTION UNIT

The different types of culturable lands in the village have been assessed in order to ascertain potential productivity on the basis of varying yields of crops. Table LV shows the relative productivity ratings of different types of cultivated lands and total numbers of Potential Production Units, computed for each of them.

Table LV

Average Yield per acre of Normal Standard Farmland in the Village : 635 kilogram or 1 P.P.U.

Type of Lands	Area in acres	Average yield per acre in kilograms	Productivity rating per acre	Number of P.P.U.
A	35.08	971	1.53	53.67
BI	5.12	635	1.00	5.12
BII	43.75	563	0.89	38.94
C	2.43	0	0	0
Total ...	86.38			97.73

The Table shows that the total number of Potential Production Units is greater than the total amount of culturable land. It is due to the high productivity rating per acre of A quality lands. These lands, which have the second largest area, are equal to 1.53 P.P.U. per acre and provide the largest contribution to the total number of P.P.U. The BI quality lands have the normal standard productivity being 1 P.P.U. per acre. The BII lands are slightly inferior to the BI quality lands. These lands possess the largest part of the area under cultivation, but owing to lower Productivity rating per acre, their contribution to the number of P.P.U. is low. The poor quality (C) lands have neither crop orduction nor provide P.P.U.

However, a considerable proportion of medium quality lands, particularly of BI lands may well be improved, if manuring, facilities of irrigation are sufficiently extended and soil preparation and weeding are improved. Similarly the productive efficiency of a considerable part of BII lands may well be improved to that of BI lands through these measures. The productive efficiency of a cultivated land, particularly of medium quality (BI and BII) lands, suffers considerably if the cultivation lacks manuring, green manuring or fertilizer, on the one hand, and irrigation, on the other. The deficiency of both of them mars the fertility of the land considerably.

LAND UTILIZATION IN DHAKA

LOCATION

The village Dhaka lying in the Pawayan Tahsil is located at 80°16'5" E. long. and 28°20'42" N. lat. The village is situated in a level plain which has a gentle slope from northwest to southeast. The land possesses generally a good fertile loamy soil. It lies in the Khutar <u>pargana</u> and is bounded by the village of Jadenpur Kalan in the northwest, Bela in the east, Japwa in the north, Damun Nagar in the southeast, and the river Kathna in the southwest, while on the western side of the river lies village Kesarpur Kalan (Fig.77). The drainage of the village and the flow of river Kathna is from northwest to southeast. The village is about 3 kilometres southwest of Jugrajpur railway station.

There are no roads in the village; however, an unmetalled road forms its northeastern boundary which links village Jadenpur Kalan, Japwa and village Bela. A few cart-tracks connect Dhaka with the surrounding villages.

CLIMATE

There are no records of climatic data for the village. The rainfall data, however, recorded at Khutar, may be considered approximate for rainfall conditions of the village. The data have been given in the Tables LVI and LVII.

Table LVI

Rainfall in the Kharif Season, 1962 .. (Khutar)

	MONTHS					
	June	July	Aug.	Sept.	Oct.	Total
Rainfall in millimetres in the kharif season, 1962.	124.2	272.2	-	285.8	-	682.2
Rainy days in the Kharif, 1962.	4	11	-	7	-	
Average rainfall in millimetres.	138.9	257.9	303.4	217.2	63.0	980.4

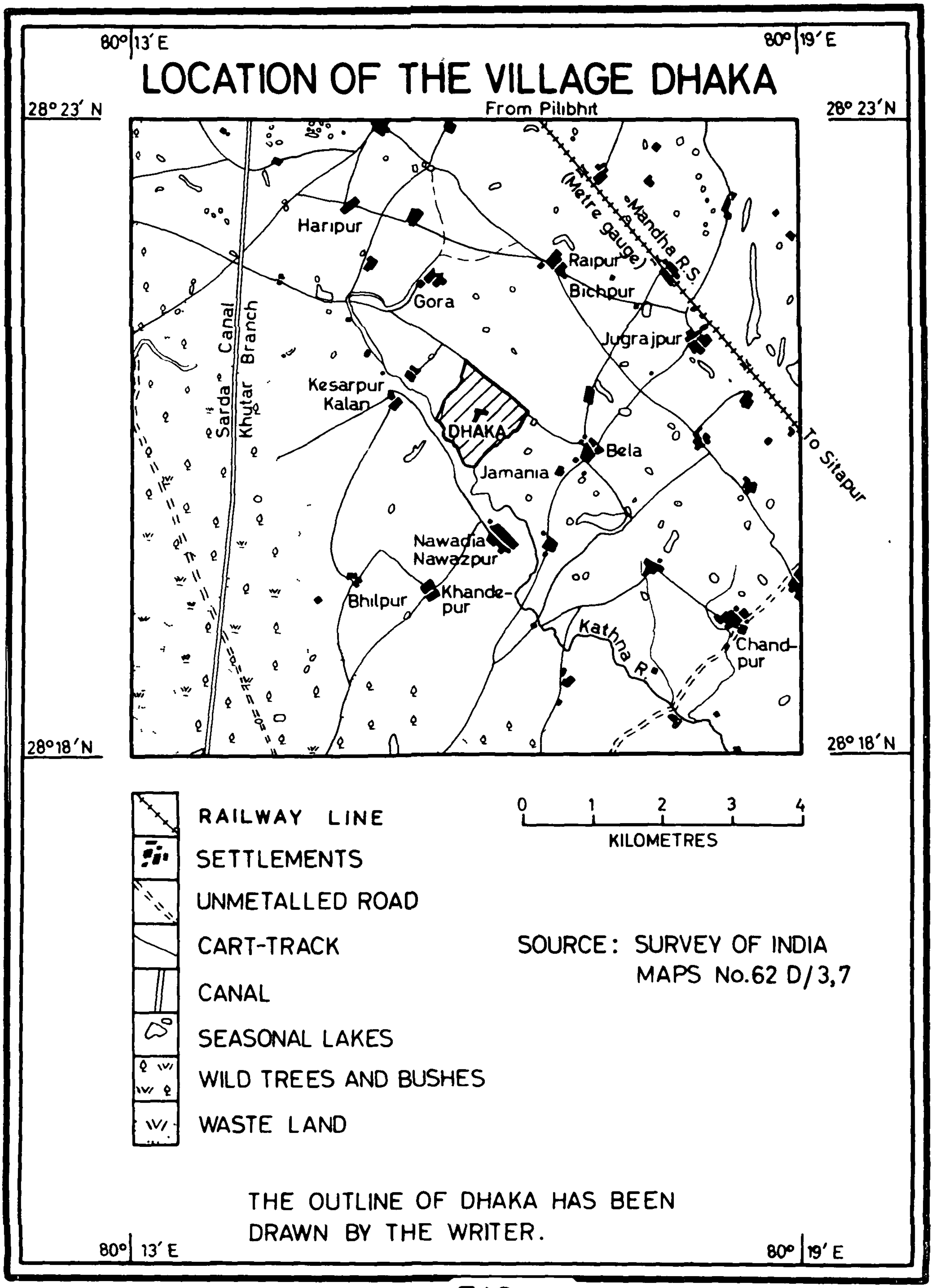

LOCATION OF THE VILLAGE DHAKA
80° 13′ E
80° 19′ E
28° 23′ N
28° 18′ N
From Pilibhit
(Metre gauge)
Mandha R.S.
To Sitapur
Haripur
Raipur
Bichpur
Gora
Jugrajpur
Kesarpur Kalan
DHAKA
Bela
Jamania
Sarda Canal
Khutar Branch
Nawadia Nawazpur
Bhilpur
Khande-pur
Kathna R.
Chand-pur
RAILWAY LINE
SETTLEMENTS
UNMETALLED ROAD
CART-TRACK
CANAL
SEASONAL LAKES
WILD TREES AND BUSHES
WASTE LAND
0 1 2 3 4
KILOMETRES
SOURCE: SURVEY OF INDIA MAPS No.62 D/3,7
THE OUTLINE OF DHAKA HAS BEEN DRAWN BY THE WRITER.

FIG.77

The Table LVI reveals that June received rainfall below the average, while August was totally rainless. The rainfall in July and September exceeded monthly average. The rainfall in the season was deficient with a shortage of 298.2 millimetres from average.[1] The practice of transplantation of rice is small as compared to broadcast rice cropping in the village.

Table LVII

Rainfall in the Rabi Season, 1962-63 ... (Khutar)

	MONTHS					
	Nov.	Dec.	Jan.	Feb.	March	Total
Rainfall in millimetres in the rabi season, 1962-63	-	-	37.3	7.6	7.6	52.5
Rainy days in rabi, 1962-63	-	-	2	1	1	
Average rainfall in millimetres	5.4	6.5	20.2	22.8	14.0	68.9

The above Table shows that the period of November and December was rainless. However, January received considerable amount of rainfall which was good for the rabi crops, particularly wheat, gram and peas. Rainfall in February and March was deficient. The total seasonal rainfall was less than average.

LAND CLASSIFICATION

The classification of various productive and unproductive lands has been attempted on the basis of fertility and productivity into A, BI, BII and C quality lands (Fig 78). The good quality (A) lands[2] have an area of 116.67

1. The averages are of fifty three years, since the establishment of rainfall station at Khutar.
2. This type of land has the best fertile soil locally called '<u>goind</u>' and '<u>gohan</u>'. The land cropped with vegetables is called '<u>kachhiana</u>'.

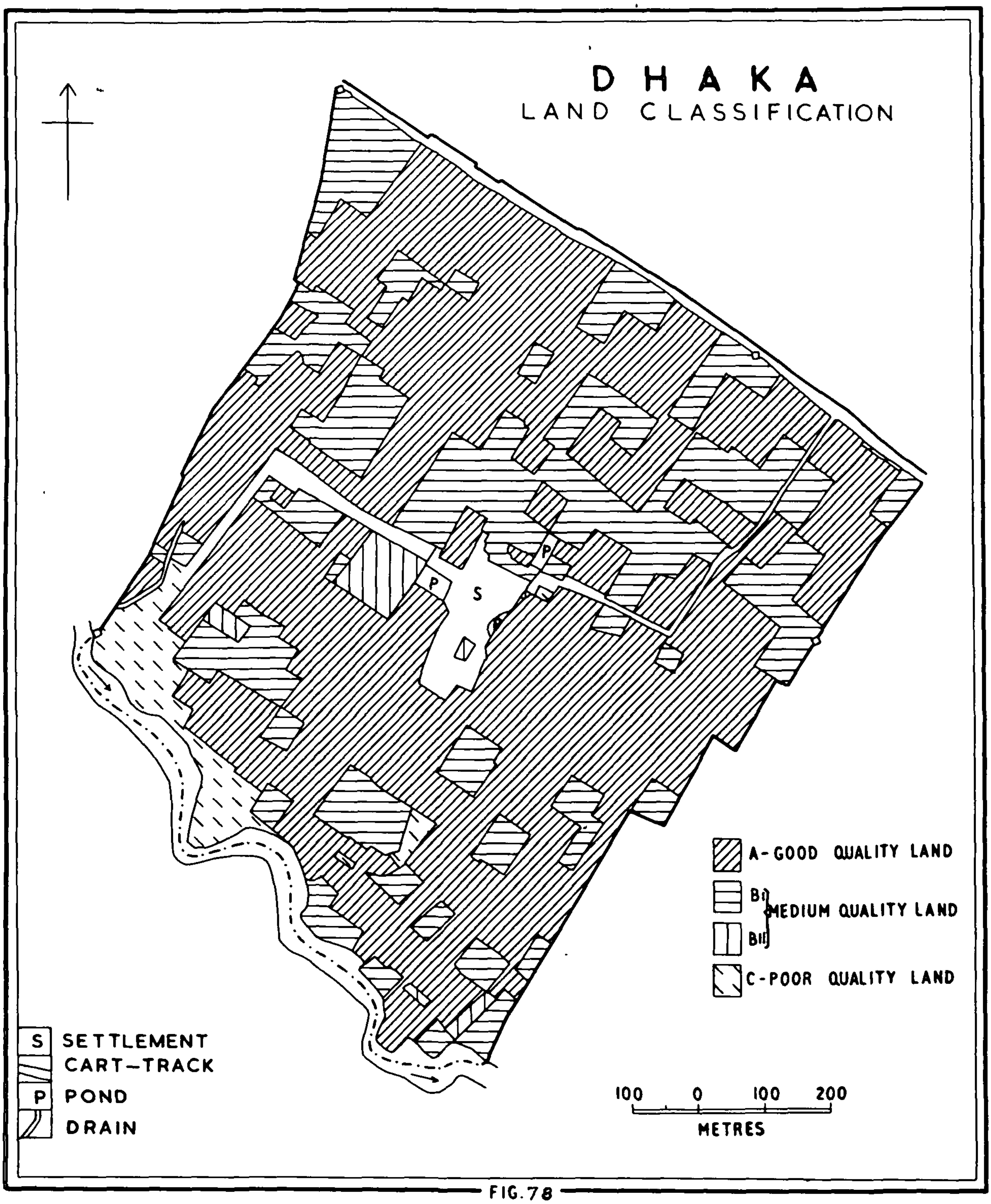

DHAKA
LAND CLASSIFICATION
S
P
A- GOOD QUALITY LAND
Bi
MEDIUM QUALITY LAND
Bii
C-POOR QUALITY LAND
S SETTLEMENT
CART-TRACK
P POND
DRAIN
100 0 100 200
METRES

FIG.78

acres in the village, being 38.4 per cent of the total cultivated land. The A quality lands on the outskirts of the village settlement are superior to all ~~due~~ owing to regular application of human faeces in all seasons. The good quality (A) lands are devoted to double cropping and to the sugarcane production which is not usefully grown on other types of lands.

The medium quality (B) lands, inferior in production to the A quality lands, are sub-divided into BI and BII categories. The lands which produce only one crop in either the kharif or the rabi season and are left fallow in the other season for recuperation of fertility are classed as BI lands. The area of the BI lands is 112.37 acres or 36.6 per cent of the total cultivated area. The BII lands which are left fallow[1] for two or three continuous seasons for recuperation of fertility are inferior to the BI lands. The soil of BII lands is generally more sandy in texture than that of BI lands. The BII lands are rarely irrigated and manured. Millets, pulses, oilseeds and 'bejhar'[2] are generally grown on these lands. The area of the BII lands is 77.6 acres or 25.3 per cent of the total cultivated land. The area of the waste lands is 1.52 acres or 0.48 per cent of the whole village area and is classed as poor quality (C) land.

IRRIGATION

The irrigated and unirrigated portions of the cultivated lands are shown in Fig. 79. Only sugarcane is irrigated in the kharif season and most of the irrigation is done in the rabi season. The shortage of rainfall is made up with irrigation, particularly in the rabi season.

The sources of irrigation in the village are the river, ponds, 'rahat' (at masonry well), 'charas' and 'dhekli' (at non-masonry wells). The crops of wheat, gram, peas and potato are mostly irrigated, the crops of mixed cereals

1. These lands are locally known as "parti jadeed".
2. The crop of 'bejhar' includes barley-peas-gram (mixed); it is a food of poor people.

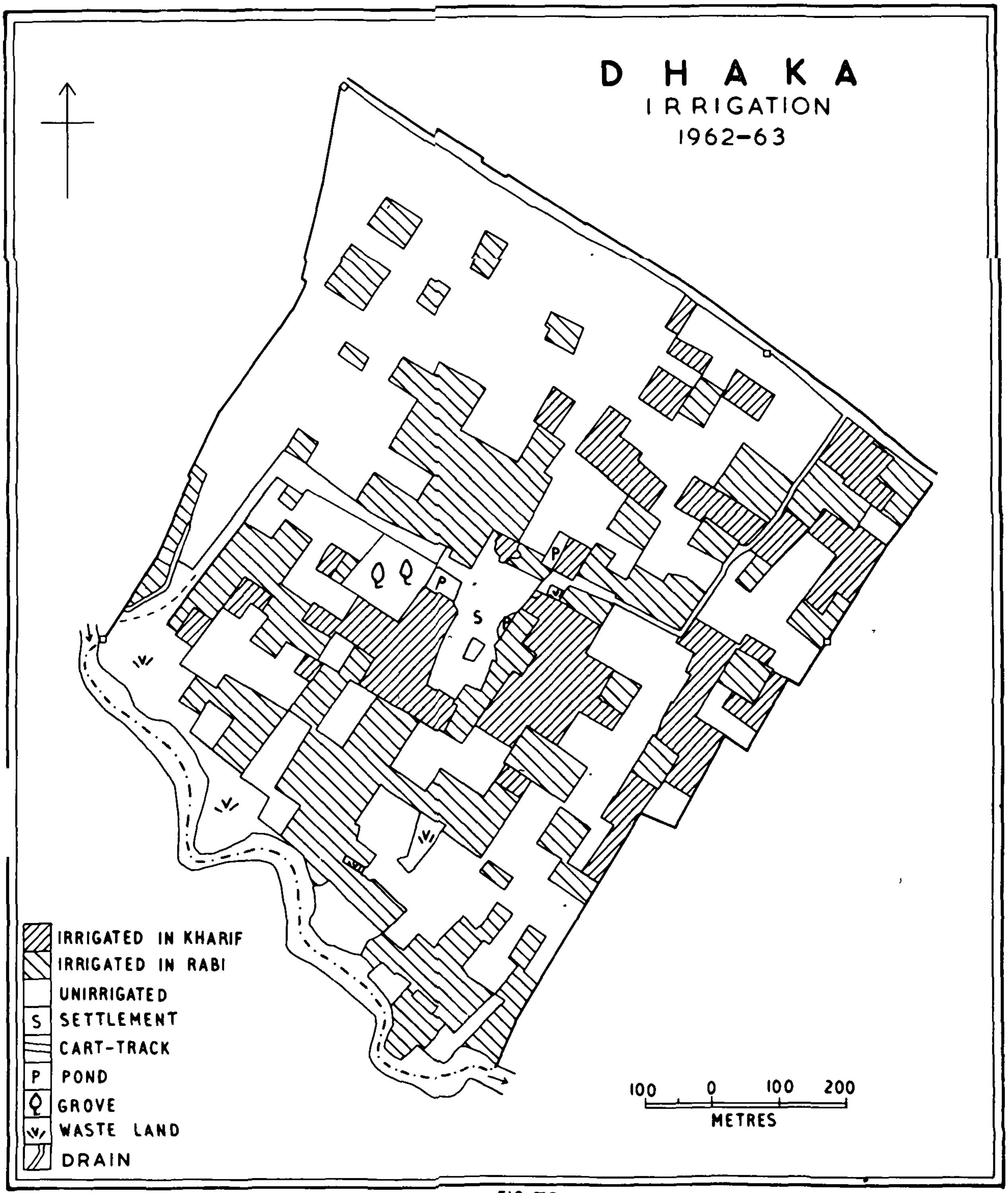

D H A K A
IRRIGATION
1962-63
IRRIGATED IN KHARIF
IRRIGATED IN RABI
UNIRRIGATED
S SETTLEMENT
CART-TRACK
P POND
GROVE
WASTE LAND
DRAIN
100 0 100 200
METRES

FIG. 79

are only occasionally irrigated. The large scale irrigation is done through the '<u>boke</u>', '<u>rahat</u>' and '<u>charas</u>' while the small scale irrigation, as that to the vegetables, is done through '<u>dhekli</u>'.

The masonry wells in the village are only a few, while non-masonry wells are seasonal and temporary. Four persons may irrigate one acre of land in one day through the '<u>boke</u>' (lift) method from the river or a pond; while the '<u>charas</u>' or '<u>rahat</u>' may also irrigate about one acre of land. The cost of irrigation in the year of inquiry was rupees 6.00 per acre through '<u>boke</u>' method from the river or a pond, while from a well rupees 8.25 paise.

<u>LAND UTILIZATION</u>

The lands under cultivation and under other uses in the year 1962-63 are shown in Fig.80. The areas of different uses of land in the village and their percentage to the total area of the village are given in Table LVIII.

Table LVIII

Total Area of the Village ... 319.57 acres

Use of Land	Area in acres	Percentage to the total area
Cultivated land	306.64	95.95
Waste land	1.52	0.48
Settlement	4.30	1.34
Cart-track	4.06	1.27
Pond	0.56	0.18
Grove	2.49	0.78
Total ...	319.57	100.00

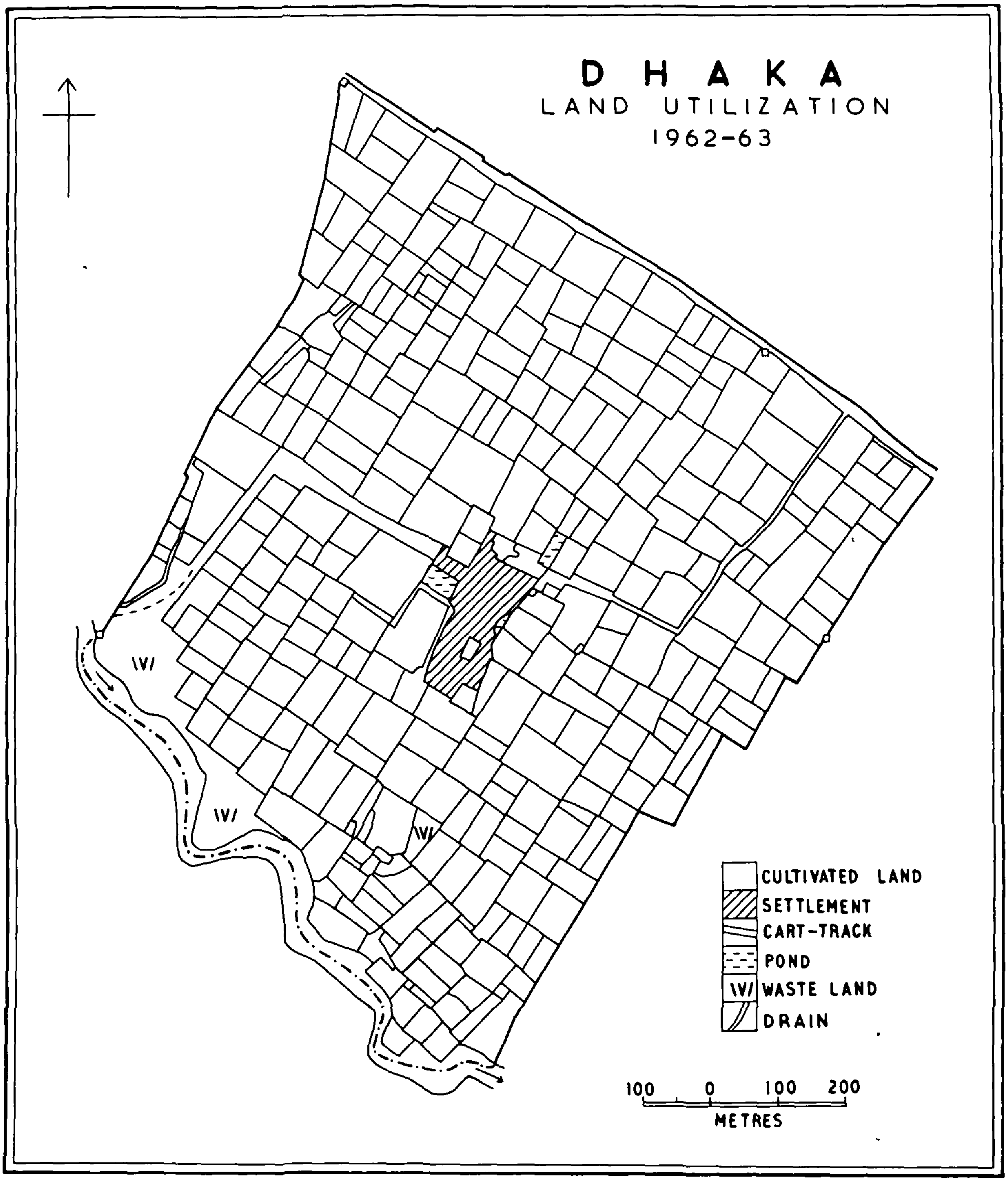

DHAKA
LAND UTILIZATION
1962-63
W
W
W
CULTIVATED LAND
SETTLEMENT
CART-TRACK
POND
WASTE LAND
DRAIN
100 0 100 200
METRES

FIG. 80

The Table LVIII reveals that 95.95 per cent of the village-area is under plough, while 4.05 per cent includes all other uses alongwith groves and settlement. There are no meadows to graze cattle and no woodland to provide fuel to the villagers. The people, therefore, prepare thousands of dung-cakes and pile them up into numerous heaps to meet the fuel needs round the year. They may be seen on all sides of the village site.

The cultivated fields are generally rectangular in shape. The owners of the fields under permanent boundaries are called '<u>bhumidhar</u>', who occasionally sub-divided a field into two or more parts[1] to sow different crops in each part, according to his own needs and convenience.

LAND UTILIZATION IN THE KHARIF SEASON

The distribution of crops and other uses of land in the kharif season, 1962, are shown in Fig. 81. The Table LIX gives a summary of the area occupied by each crop and its percentages to the total cultivated land and to the net cropped land.

The Table LIX indicates that (48.50+14.83)= 63.33 per cent of the total cultivated land is cropped in the kharif season. Out of the net cropped land in the season, 76.57 per cent is occupied by the grain crops, whereas 23.43 per cent is under non-cereal crops.

Among the grain crops, broadcast rice is predominant, occupying 58.2 per cent of the net cropped land. Rice (transplanted) ranks second, being 15.34 per cent. <u>Arhar</u> pulses (pigeon pea) alone and mixed with big millet and small millet, are small crops.

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1. Each sub-divided part is locally known as '<u>kiari</u>'.

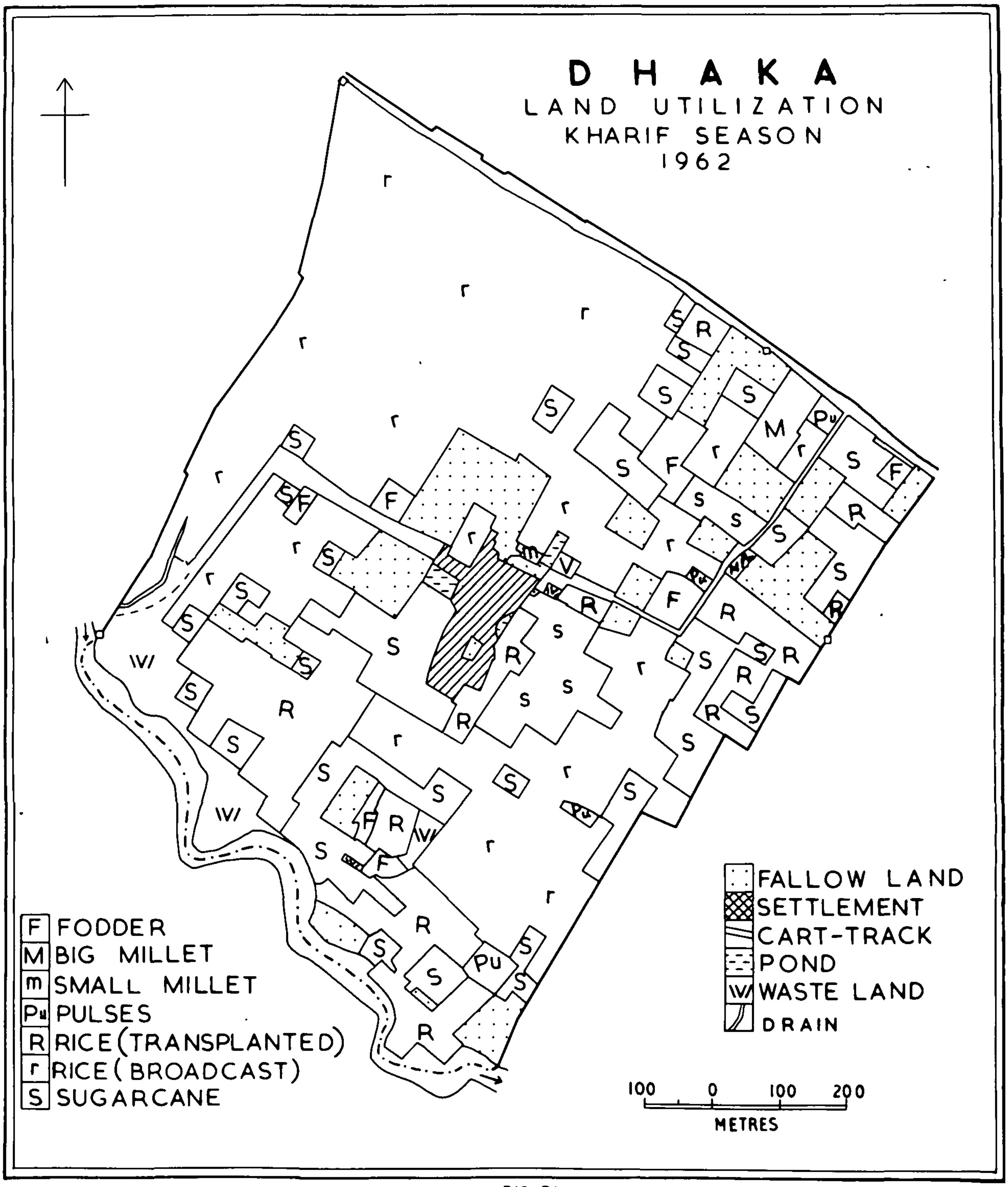
DHAKA
LAND UTILIZATION
KHARIF SEASON
1962
F FODDER
M BIG MILLET
m SMALL MILLET
Pu PULSES
R RICE (TRANSPLANTED)
r RICE (BROADCAST)
S SUGARCANE
FALLOW LAND
SETTLEMENT
CART-TRACK
POND
W WASTE LAND
DRAIN
100 0 100 200
METRES

FIG. 81

Table LIX

Total Cultivated Land ... 306.64 acres

Net Cropped Land in the Kharif Season ... 194.20 acres

Crops	Area in acres	Percentage to the total cultivated land	Percentage to the net cropped land	Total percentage to the total cultivated land	Total percentage to the net cropped land
Grain Crops				48.50	76.57
Rice (broadcast)	113.03	36.86	58.20		
Rice (transplanted)	29.79	9.72	15.34		
Big millet and pulses	2.70	0.88	1.39		
Pulses	2.15	0.70	1.10		
Small millet	1.04	0.34	0.54		
Other Crops				14.83	23.43
Sugarcane	43.47	14.17	22.39		
Fodder	2.02	0.66	1.04		
Fallow	112.44	36.67		36.67	
Total ...	306.64	100.00	100.00	100.00	100.00

Among non-cereal crops, sugarcane occupies 22.39 per cent of the net sown area in the season. The fodder crop has only 1.04 per cent of the net sown area. '<u>Chari</u>'[1] is the chief fodder crop.

A large proportion of the cultivated land, 36.67 per cent, is under fallowing in the kharif season, which is nearly equal to the largest crop of the season, rice (broadcast). The largeness of fallow land in the village indicates huge amount of medium quality lands. A considerable part of the

1. '<u>Chari</u>' is crop of green plants of big millet (jowar) which are used as fodder.

land is, therefore, put to fallowing for two or more seasons to recuperate its fertility.

LAND UTILIZATION IN THE RABI SEASON

The distribution of crops of the rabi season, 1962-63, and the other uses of land are shown in Fig.82. Table LX gives a summary of each cereal and non-cereal crop. The percentages of each of them to the total cultivated land and to the net cropped land are also given in it.

Table LX

Total Cultivated Land ... 306.64 acres

Net Cropped land in the Rabi Season ... 108.04 acres

Crops	Area in acres	Percentage to the total cultivated land	Percentage to the net cropped land	Total percentage to the total cultivated land	Total percentage to the net cropped land
Grain Crops				34.99	99.32
Gram	31.93	10.41	29.56		
Lentil	30.54	9.96	28.27		
Wheat	16.80	5.48	15.55		
Peas	11.91	3.88	11.02		
Wheat-gram	9.39	3.06	8.69		
Barley	4.74	1.55	4.39		
Barley-peas-gram (mixed)	1.99	0.65	1.84		
Other Crops				0.24	0.68
Oilseeds	0.50	0.16	0.46		
Potato	0.24	0.08	0.22		
Continual Kharif Crops	46.17	15.06		15.06	
Fallow	152.43	49.71		49.71	
Total ...	306.64	100.00	100.00	100.00	100.00

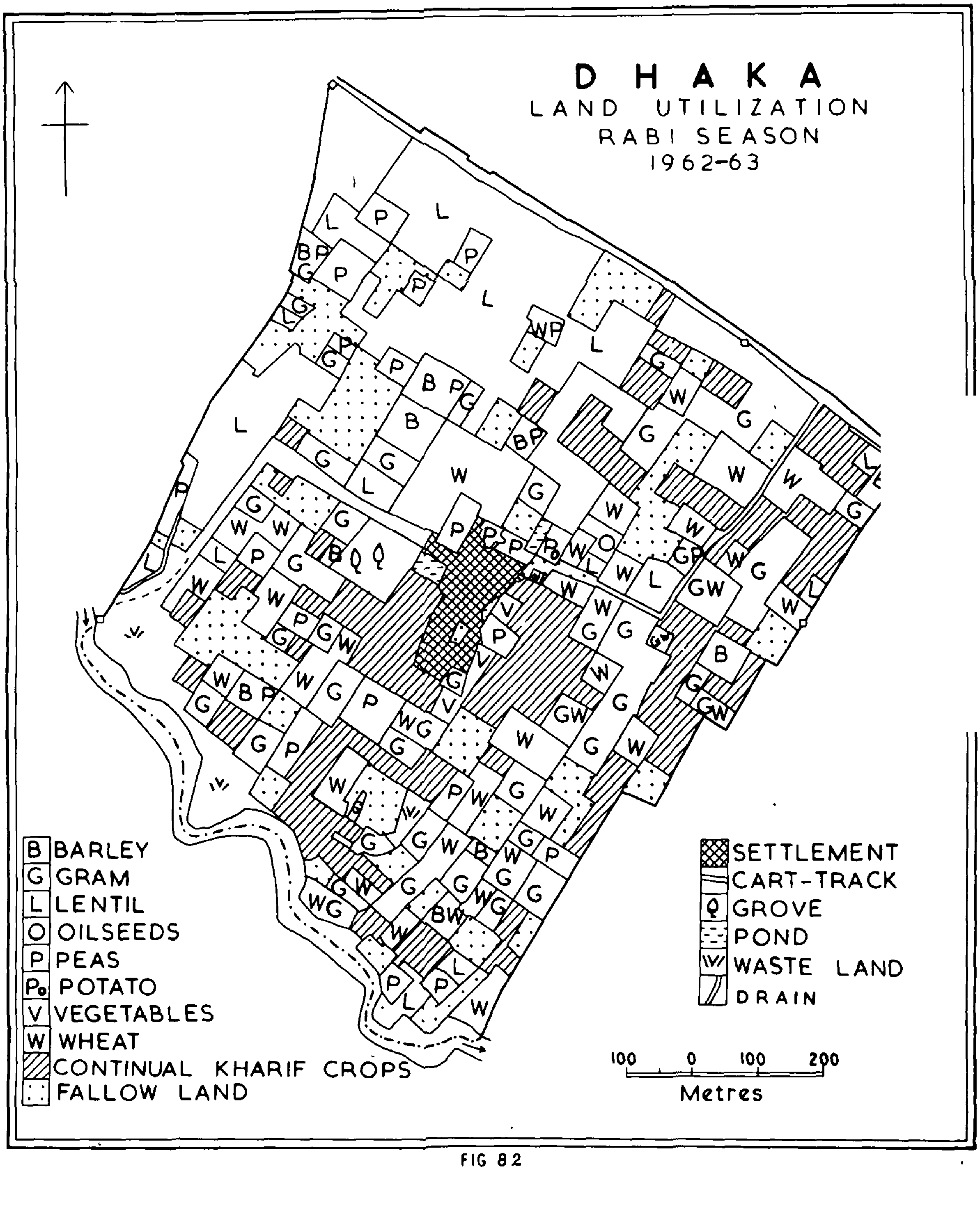
DHAKA
LAND UTILIZATION
RABI SEASON
1962-63
B BARLEY
G GRAM
L LENTIL
O OILSEEDS
P PEAS
Po POTATO
V VEGETABLES
W WHEAT
CONTINUAL KHARIF CROPS
FALLOW LAND
SETTLEMENT
CART-TRACK
GROVE
POND
WASTE LAND
DRAIN
100 0 100 200
Metres

FIG 82

It will be seen from the Table LX that (34.99 + 0.24)= 35.23 per cent of the total cultivated land is cropped in the rabi season. The continual kharif crops; sugarcane and pulses (pigeon pea), occupy 15.06 per cent and about half of the total cultivated land, (49.71 per cent) is under fallowing.

Out of the net cropped land in the rabi season, 99.32 per cent is cultivated with cereal crops, while only 0.68 per cent is under other crops of oilseeds and potato.

Among the grain crops, the biggest areas are occupied by crops of gram (29.56 per cent) and lentil (28.27 per cent) of the net cropped land. Wheat is the third largest crop being 15.55 per cent. Peas and wheat-gram (mixed) are other considerable crops, while barley and '<u>bejhar</u>'[1] are the smallest crops of the season among grain crops.

There are no fodder crops in this season, as this need is mostly fulfille[2] by the green leaves of harvested sugarcane.

DOUBLE CROPPED LAND

The area which is cropped two times in the year, in the kharif as well as in the rabi season, is depicted in Fig. 83. The area under the double cropping is 73.20 acres or 23.9 per cent of the total cultivated land of the village. All the double cropped area possesses good quality (A) land. The area under double cropping may have slight change in acreage from year to year according to provisions or absence of manuring and irrigation to the cultivated land. The double cropping may well be increased through improving fertility of the cultivated land by sufficient manuring and irrigation. The double cropped land per head is 0.276 acre.

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1. '<u>Bejhar</u>' is the mixed crop of barley,peas and gram.
2. The green leaves, cut off from the head of the harvested sugarcane is gathered into bundles at the fields and is locally called '<u>goula</u>' with a usual weight of 20-30 kilograms. The dry leaves of sugarcane are locally called '<u>patti</u>' and during the process of composting the '<u>patti</u>' is called as '<u>chourha</u>'; however, the <u>patti</u> is mostly used as fuel for household purposes.

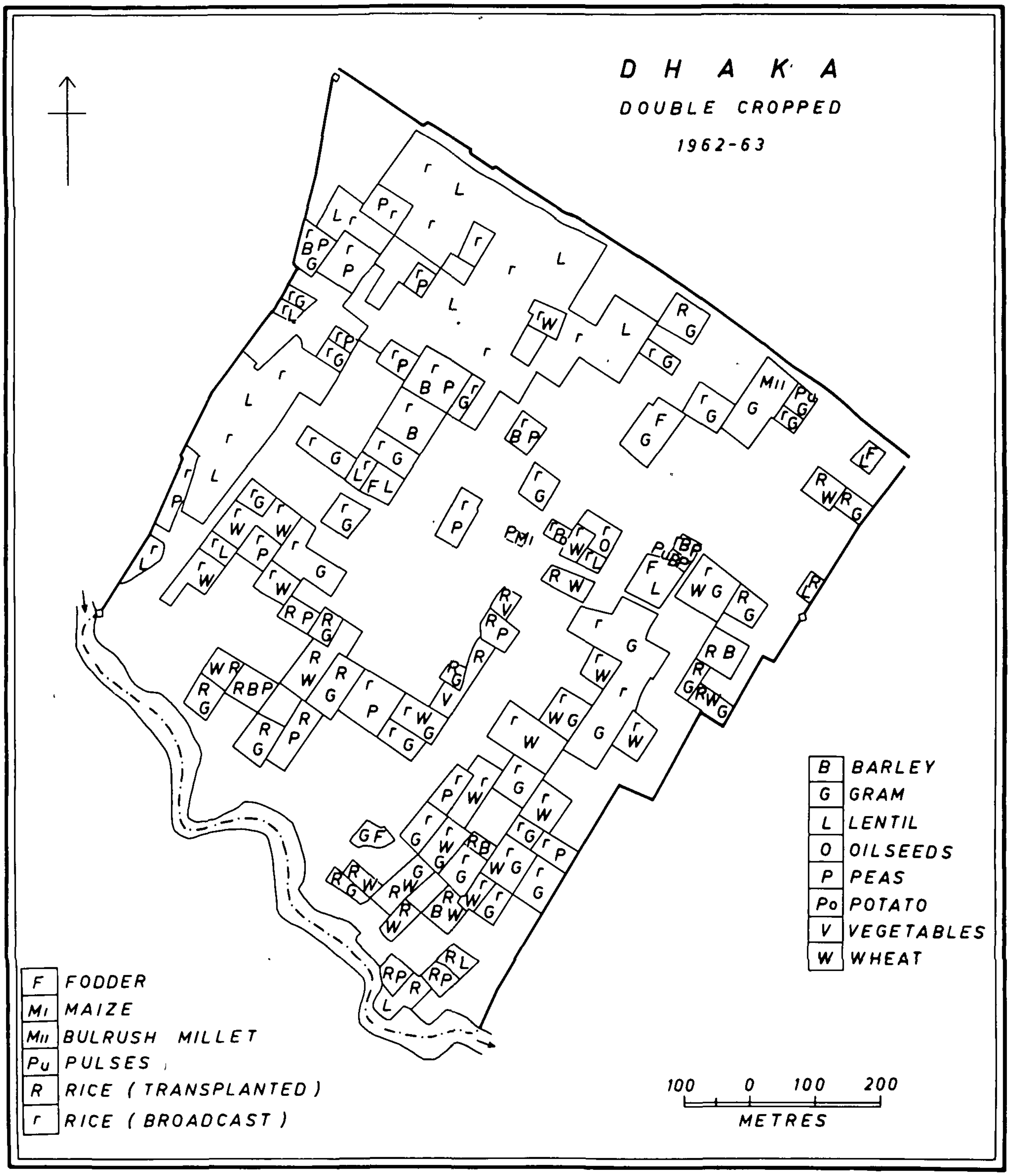

D H A K A
DOUBLE CROPPED
1962-63
B BARLEY
G GRAM
L LENTIL
O OILSEEDS
P PEAS
Po POTATO
V VEGETABLES
W WHEAT
F FODDER
MI MAIZE
MII BULRUSH MILLET
Pu PULSES
R RICE (TRANSPLANTED)
r RICE (BROADCAST)
100 0 100 200
METRES

FIG.83

ROTATION OF CROPS

The rotations of crops in various types of lands in the village are generally the same as in previous village. The crop-rotations in Dhaka and in the surrounding villages are generally the same.

The good quality (A) lands are mostly devoted to rice (transplanted and broadcast), sugarcane,gram,wheat, wheat-gram (mixed) and peas. The BI quality lands, which are cropped in either the kharif or the rabi season, are generally devoted to rice (broadcast), millets, wheat, wheat-barley, peas-barley (mixed), peas and lentil.

The BII quality lands produce the above crops, but after fallowing for at least two continuous seasons.

However, the production of rice is predominant in the rotations. Out of the 76.57 per cent of the net cropped land in the kharif season, 73.54 per cent is devoted to only rice.

LAND USE AND POPULATION

The total population dependent upon the produce of the village is 265. Table LXI shows the total and the per capita share in the total land, total cultivated land, net cropped areas in the kharif and rabi seasons, gross cultivated land and the double cropped land.

The Table LXI shows that per capita share of total land available for cultivation is 1.157 acres, which decreases to 0.733 acre in the kharif season owing to large fallowing. The per capita share further decreases to 0.408 acre in the rabi season on account of 65 per cent of the total cultivated land remains under fallowing and continual kharif crops.

Table LXI

Total Population of Village Dhaka ... 265
(Areas in acres)

	Total area of the village	Total cultivated land 1 available	Net cropped land in the kharif season	Net cropped in the rabi season	Gross cultivated land (both of kharif and rabi)	Double cropped land
	319.57	306.64	194.20	108.04	302.24	73.20
Land per head of population	1.206	1.157	0.733	0.408	1.140	0.276

The gross cultivated land of kharif and rabi seasons per head of population amounts to 1.140 acres. The amount of land which actually supports one person in the village is thus 1.140 acres. On the other hand, the double cropped land per head is 0.276 acre.

Out of the total population, 96 per cent are primary rural or cultivators and the rest are secondary rural who are dependent on the produce of the cultivating class through their ancillary services; they include the tailor, carpenter and shop-keeper.

CALORIC INTAKE

The yield rates of various crops of the kharif and the rabi seasons in the village are given in Table LXII A.

The crop yields differ from one soil type to another. However, the yield rates given in the Table LXII A are related to the lands in which the crops are mostly grown.

1. It includes 77.60 acres of cultivated land which remained under fallowing during both kharif and rabi seasons.

Table LXII A

Crops	Yield per acre (in kilograms)
Rice (broadcast) unhusked	672
Rice (transplanted) unhusked	746
Big millet (sown with pulses)	167
Pulses (sown with millet)	112
Pulses (sown alone)	153
Small millet	137
Canesugar (gur)	1,567
Gram	709
Lentil	224
Wheat	618
Peas	746
Barley	638
Potato	1,306

Table LXII B gives the total production of each foodstuff in the village. After deducting the amounts of expert and seeds preserved, the actual per head per day consumption has been calculated in terms of calories. The villagers expert a part of their land produce to meet their other needs.

The Table indicates that per capita daily caloric intake of food is 2,259 calories revealing an adequate diet. The largest intake of calories to the diet is from broadcast rice and wheat while the other considerable crops are in order: rice (transplanted), gram, sugar (gur), wheat-gram (mixed) and peas. Other crops are minor.

Table LXII B

FOOD BALANCE SHEET

VILLAGE DHAKA

(in kilograms)

Population ... 265 | Year 1962-63

Commodity	Production	Total Production	Export	Import	Available Supply	Seed	Food (Gross)	Extraction rate per cent	Food (net)	Per head Consumption: Kilograms per year	Per head Consumption: Grams per day	Per head Consumption: Calories per day
Rice (broadcast)	75956.2	75956.2	45573.0	-	30383.2	3163.7	27219.5	66 2/3	18146.3	68.476	187.6	669.7
Rice (transplanted)	22223.3	22223.3	11111.0	-	11112.3	277.9	10834.4 493.6	66 2/3	7222.9	27.256	74.7	268.2
Big millet (sown with pulses)	504.9	504.9	-	-	504.9	11.3	493.6	95	468.9	1.769	4.8	16.5
Pulses (sown with millets)	302.4	663.6	-	-	663.6	11.2	652.4	95	619.8	2.339	6.4	21.9
Pulses (sown alone)	361.2											
Small millet	194.5	194.5	-	-	194.5	4.9	189.6	95	180.1	0.679	1.9	6.5
Sugar (gur)	68117.5	68117.5	58577.0	-	9540.5	4216.5	5324.0		5324.0	20.091	55.0	193.1
Gram	22638.4	22638.4	13583.0	-	9055.4	1638.9	7416.5	95	7045.7	26.587	72.8	260.6
Lentil	6840.9	6840.9	4560.0	-	2280.9	171.0	2109.9	95	2004.4	7.564	20.7	71.6
Wheat	10382.4	10382.4	-	-	10382.4	924.0	9458.4	90	8512.6	32.123	88.0	293.9
Peas	8884.9	8884.9	4442.0	-	4442.9	619.3	3823.6	95	3632.4	13.707	37.5	129.8
Wheat-gram	6197.4	6197.4	-	-	6197.4	499.3	5698.1	92	5242.3	19.782	54.2	187.5
Barley	3024.1	3024.1	-	-	3024.1	243.3	2780.8	70	1946.6	7.346	20.1	66.7
Barley-peas-gram	1353.2	1353.2	-	-	1353.2	103.5	1249.7	86 2/3	1083.0	4.087	11.2	38.7
Potato	313.4	313.4	-	358.4	671.8	39.8	632.0	85	537.2	2.027	5.6	3.9
Total												2258.6

POTENTIAL PRODUCTION UNIT

On the basis of varying productivity, the different types of productive and unproductive lands in the village have been assessed to ascertain their potential productivity. Table LXIII shows the relative productivity ratings of these lands; the total numbers of Potential Production Units, as computed for each of them, are shown in it.

Table LXIII

Average Yield per acre of Normal Standard Farmland in the Village: 565 kilograms of 1 P.P.U.

Type of lands	Area in acres	Average yield per acre in kilograms	Productivity rating per acre	Number of P.P.U.
A	116.67	924	1.64	191.34
BI	112.37	565	1.00	112.37
BII	77.60	206	0.36	27.94
C	1.52	0	0	0
Total ...	308.16			331.65

It will be seen from the Table that the total of the Potential Production Units is greater than the total amount of productive and unproductive lands. It is due to the largest proportion of good quality (A) lands which are equal to 1.64 P.P.U. per acre. The large productivity rating per acre is owing to large yield of canesugar.

The BI quality lands have the normal standard productivity which is equal to 1 P.P.U. per acre.

The BII lands are inferior in productivity to the normal standard farmland. The BII lands are about one fourth of the total cultivated area in the village.

The C quality lands have neither production nor P.P.U. However, the productivity of BI lands may be raised to that of good quality (A) lands if facilities of manuring and irrigation are sufficiently extended. Similarly the productivity of the BII lands may be increased to that of BI productivity standard, at least for a considerable part. It is because both manuring and irrigation have an outstanding effect in raising the productivity of the agricultural lands; and inadequate supply of them to the producing land has a considerable adverse effect; for example, the BII lands suffer much from these deficiencies.

CHAPTER VIII

LAND UTILIZATION IN JUNAWAI

LOCATION

The village Junawai, lying in the Gunnaur Tahsil, is situated at 78°30'0" E.long. and 28°11'45" N.lat. The village is situated in a plain of alluvial soil which has a gentle slope from northwest to southeast. The predominant soil of the area is sandy loam. Lying in the Asadpur pargana, Junawai is bounded by villages of Sarai Brahman, Dubtara Harkishan and Azizpur in the west, Hargoojdpur in the east, Maiboli and Riwara in the north, and Dahnipur in the southeast (Fig.31).

The village lies about 8 kilometres southeast of Gunnaur and is bisected by the Gunnaur-Bahasuan road (metalled). Other ways of transportation and communication include an unmetalled road from Islamnagar to Ram Ghat at the Ganga, and the cart-tracks connecting surrounding villages. The settlement is situated in the heart of the village around the cross-road of the metalled and unmetalled roads. The cart-tracks go to all sides from the village.

CLIMATE

No climatic data are recorded for the village. The rainfall data recorded at Gunnaur, however, may be approximately the same as for the village. The Tables LXIV and LXV give the data.

Table LXIV

Rainfall in the Kharif Season, 1962 (Gunnaur)

	MONTHS					
	June	July	Aug.	Sept.	Oct.	Total
Rainfall in millimetres in the kharif season, 1962	45.7	189.8	125.4	240.2	-	601.1
Rainy days in the kharif, 1962	4	13	9	10	-	
Average rainfall in millimetres	54.4	217.0	208.0	119.6	30.4	629.4

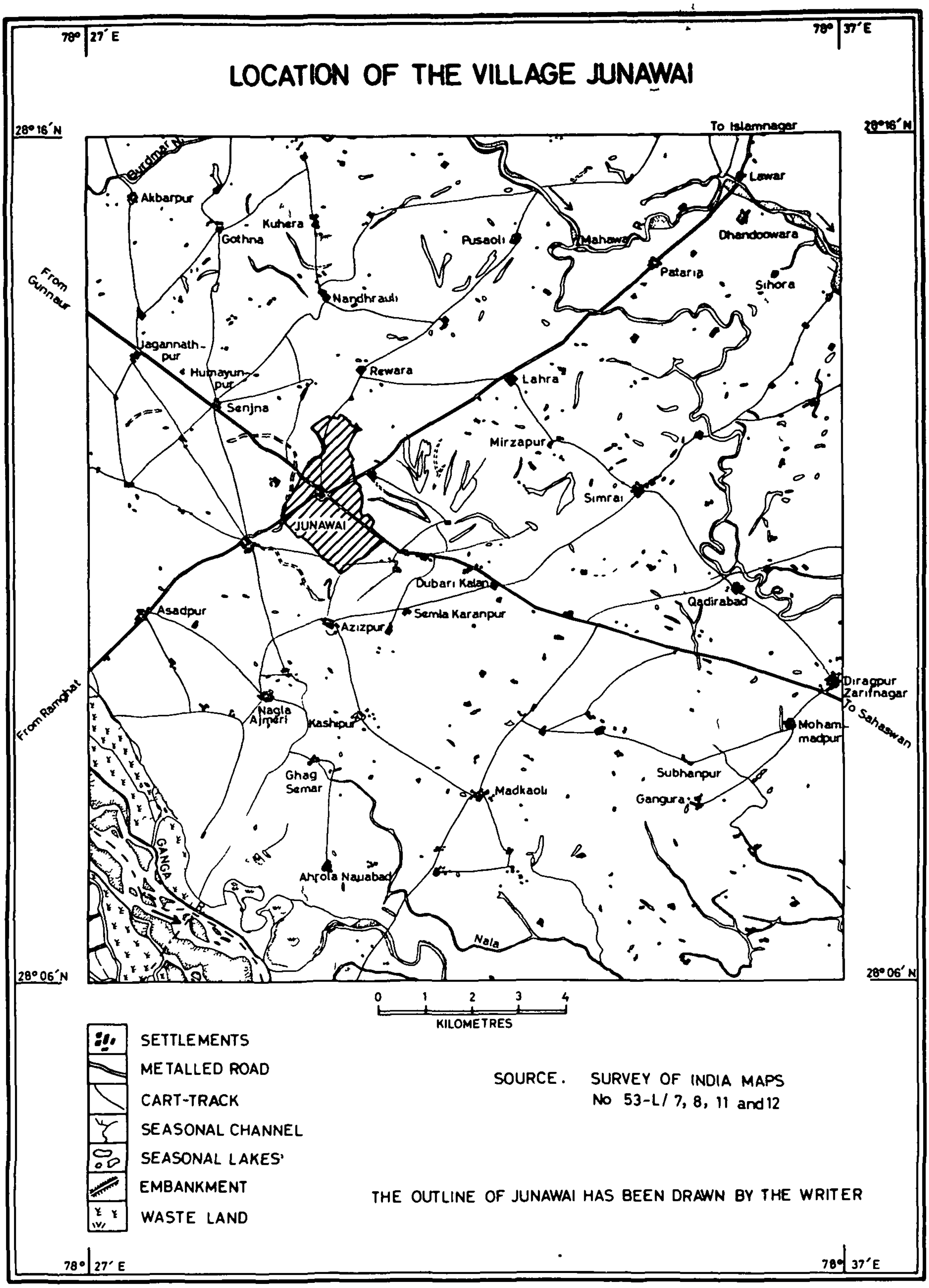

LOCATION OF THE VILLAGE JUNAWAI
78° 27′ E
78° 37′ E
28° 16′ N
28° 06′ N
To Islamnagar
From Gunnaur
From Ramghat
To Sahaswan
Akbarpur
Gothna
Kuhera
Pusaoli
Mahawa
Lawar
Dhandoowara
Pataria
Sihora
Nandhrauli
Jagannath-pur
Humayun-pur
Rewara
Lahra
Senjna
Mirzapur
Simrai
JUNAWAI
Dubari Kalan
Qadirabad
Asadpur
Semla Karanpur
Azizpur
Diragpur
Zarifnagar
Nagla Ajmeri
Kashipur
Moham-madpur
Subhanpur
Ghag Semar
Madkaoli
Gangura
GANGA
Ahrola Nauabad
Nala
0 1 2 3 4
KILOMETRES
SETTLEMENTS
METALLED ROAD
CART-TRACK
SEASONAL CHANNEL
SEASONAL LAKES
EMBANKMENT
WASTE LAND
SOURCE. SURVEY OF INDIA MAPS
No 53-L/ 7, 8, 11 and 12
THE OUTLINE OF JUNAWAI HAS BEEN DRAWN BY THE WRITER

FIG.84

The above Table shows that the sowing period of kharif crops, June-July, received less rainfall than average. August also got less rainfall while September — the last period of growth — received the double of the monthly average rainfall. There was no rainfall in October . Besides these monthly variations in rainfall, the total season received less rainfall than the average.

Table LXV

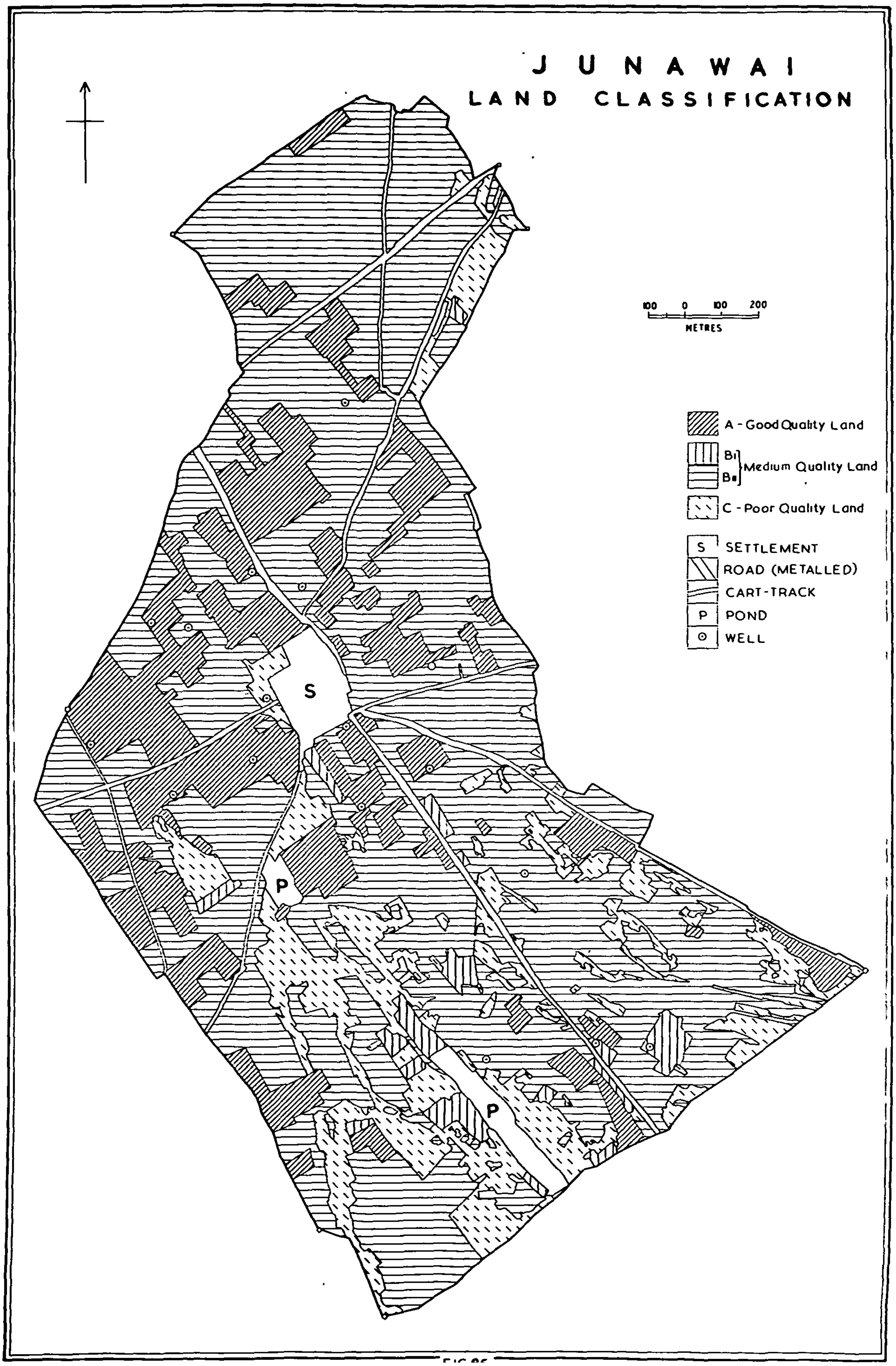
Rainfall in the Rabi Season, 1962-63 (Gunnaur)

	MONTHS					
	Nov.	Dec.	Jan.	Feb.	March	Total
Rainfall in millimetres in the rabi season, 1962-63	-	5.2	4.1	9.1	1.5	19.9
Rainy days in Rabi, 1962-63	-	1	1	1	1	
Average rainfall in millimetres	1.7	4.9	16.2	17.1	11.0	50.9

The above Table shows that November was rainless, but December rainfal was only 5.2 millimetres while January, February and March d very scanty rainfall. January received nearly one fourth of its infall, and this lack is injurious to the growth of the rabi crops, particularly when the facilities of irrigation are inadequate.

LAND CLASSIFICATION

The fields of the village have been classified into A, BI, BII and C quality lands in accordance with their varying fertility and productivity (Fig.85). The good quality (A) lands in the village have an area of 183.438



J U N A W A I
LAND CLASSIFICATION
100 0 100 200
METRES
A - Good Quality Land
BI
BII
Medium Quality Land
C - Poor Quality Land
S SETTLEMENT
ROAD (METALLED)
CART-TRACK
P POND
WELL
S
P
P

acres which come to 24.5 per cent of the total cultivated land. The soil adjacent to the village settlement is superiormost[1] as the regular application of human faeces in all seasons to this part of A quality land plays an important role in increasing the fertility. This part of land is generally devoted to crops of vegetables, sugarcane and the double cropping. The good quality A lands, being 24.7 per cent of the cultivated area, are generally devoted to the double cropping and the sugarcane production which are not so usefully grown on other types of lands.

The medium quality (B) lands produce a crop in either the kharif or the rabi season. They are sub-divided into BI or BII lands. The texture of the soil of BI lands is generally sandy loam whereas the lands of heavier soil are classed as BII lands. The BI lands with an area of 542.532 acres or 72.8 per cent of total cultivated area, are primarily devoted to millets, pulses, maize, fodder, peas, barley and '<u>bejhar</u>'[2] crops. The BII lands, being the least in area in the village have an area of 18.937 acres or 2.5 per cent of the total cultivated lands. These lands are more useful for the production of rice or gram.

The poor (C) quality lands have an area of 65.625 acres or 7.59 per cent of the total area of the village. ~~Due~~ Owing to undesirable <u>reh</u> content in the soil these lands are unproductive from time immemorial and they are waste land having thorny bushes.

<u>IRRIGATION</u>

The cultivated lands have been divided into irrigated and unirrigated parts as shown in Fig.86. The area irrigated in kharif season is small, being 2.5 per cent of the total cultivated area because only sugarcane is irrigated in kharif, while nearly all important crops of <u>rabi</u> need irrigation, and about 33.5 per cent of the total cultivated land is irrigated in the rabi season.

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1. It is locally known as '<u>kachhiana</u>'.
2. The mixed crop of wheat- barley and peas or gram-barley-peas is called '<u>bejhar</u>'.

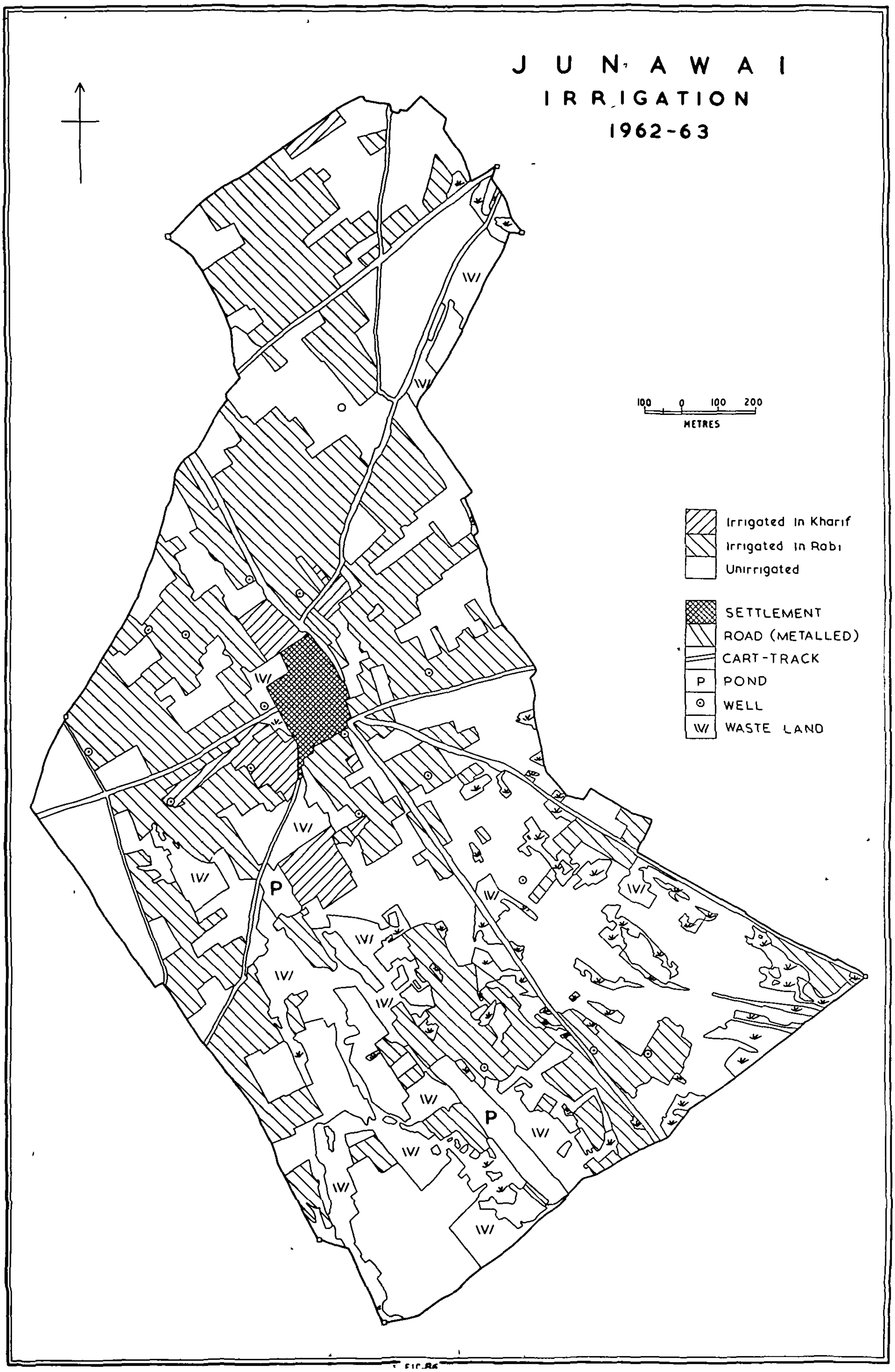

J U N A W A I
I R R I G A T I O N
1962-63
100 0 100 200
METRES
Irrigated in Kharif
Irrigated in Rabi
Unirrigated
SETTLEMENT
ROAD (METALLED)
CART-TRACK
P POND
WELL
W/ WASTE LAND
P
P

FIG. 86

The sources of irrigation in the village are not sufficient. Only a few ponds, masonry and non-masonry wells are the only sources of irrigation. The irrigation from a pond is done by '<u>boke</u>' system, the '<u>rahat</u>' or the Persian wheel is used to irrigate from a masonry well, and '<u>charas</u>' is the main system to irrigate a field from a non-masonry well. The '<u>dhekli</u>' system[1] is used only in small scale irrigation from a non-masonry well, particularly in irrigating vegetable crops.

The masonry wells in the village are few, while non-masonry wells are seasonal and temporary. The Persian wheel, '<u>rahat</u>', is often driven round by camel which is more economical than bullocks as regards fodder.

The crops of wheat, gram, peas,barley (alone or mixed) and vegetables are often irrigated. Four persons may irrigate one acre of land in one day through the <u>boke</u> system from a pond. The '<u>charas</u>' or the '<u>rahat</u>' may each irrigate an acre land in one day. The cost of irrigation in the year of inquiry was rupees 10.00 per acre through the <u>boke</u> system; while rupees 9.50 to irrigate an acre through a '<u>rahat</u>' or'<u>charas</u>' system.

<u>LAND UTILIZATION</u>

The fields under cultivation and lands under other uses in the year 1962-63 are depicted in Fig.87. The areas of different uses of land in the village and their percentages to the total area of the village are given in Table LXVI.

---

1. The '<u>dhekli</u>' system is of two types: one with the oscillatory type: a wooden stake working as a lever on another stake upon a well, the lever stake has earthen or stony weight on its back end while the earthen can hangs with a rope tied on its front end which moves up and down upon a well; the other type is of two cans, often of iron, tied on the two ends of the rope which moves on a wheel fixed on the diametral stake nearly 2 metres high above the well, the cans bring water up from the well one by one; and one labourer is enough to draw the water up from the well in both the '<u>dhekli</u>' methods.

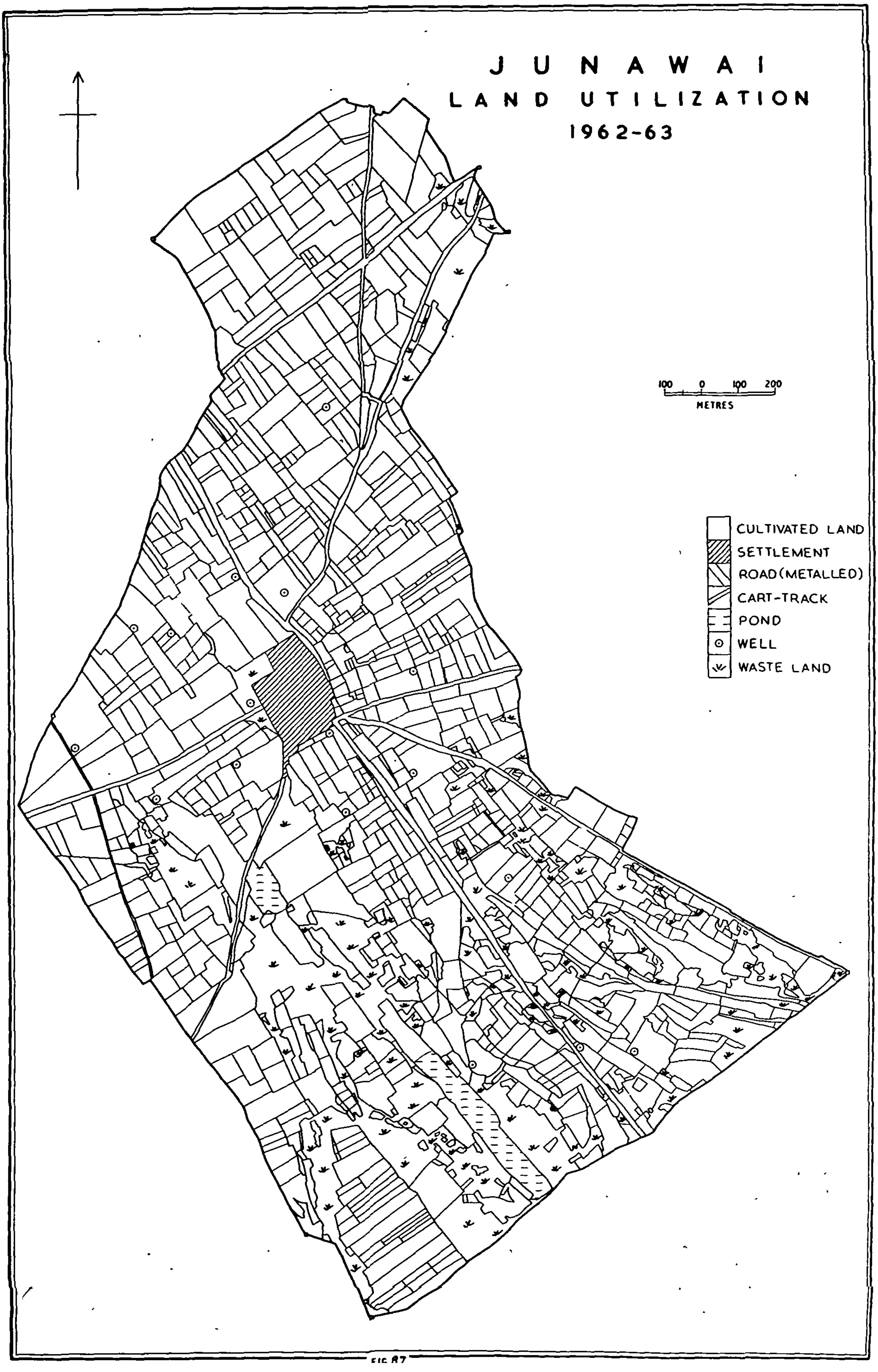

J U N A W A I
LAND UTILIZATION
1962-63
100 0 100 200
METRES
CULTIVATED LAND
SETTLEMENT
ROAD (METALLED)
CART-TRACK
POND
WELL
WASTE LAND

FIG 87

-o-

Table LXVI

Total Area of the Village ... 864.875 acres

Use of land	Area in acres	Percentage to the total area
Cultivated land	744.907	86.13
Waste land	65.625	7.59
Pond	10.187	1.18
Roads (metalled, unmetalled and cart-tracks)	30.219	3.49
Settlement	13.937	1.61
Total ..	864.875	100.00

The above Table shows that 86.13 per cent of the village area is under cultivation. The largest among the non-agricultural lands is the waste land, being 65.625 acres or 7.59 per cent. There are no groves, meadows or woodlands. The shape of the cultivated fields is usually rectangular and is partly triangular or quadrilateral, particularly on the village boundaries.

The preparation of dung-cakes[1] for fuel purposes is common in the village due to absence of any woodland in the vicinity of the village. The cultivator sub-divides a big field into two or more parts temporarily for the season or the year according to his needs.[2]

1. The numerous heaps of thousands of piled dung-cakes may be seen on all sides of the village site.
2. Each sub-division of the field is called '<u>kiari</u>' for a different crop.

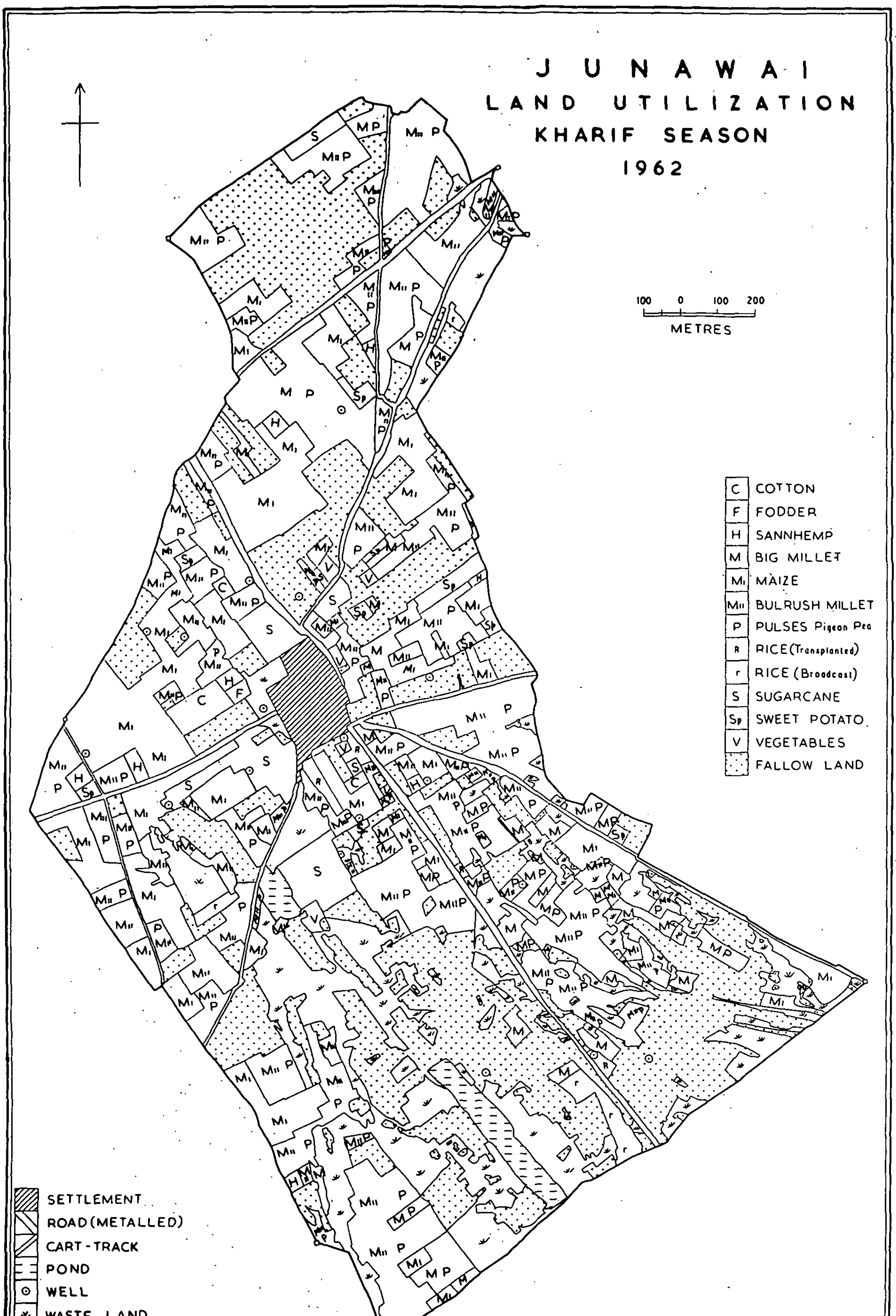
LAND UTILIZATION IN THE KHARIF SEASON

The distribution of various crops of the kharif season and other uses of land in 1962 are shown in Fig.88. The Table LXVII gives a summary of the area occupied by each crop and its percentages to the total cultivated land and to the net cropped land.

Table LXVII

Total Cultivated Land ... 744.907 acres
Net Cropped Land in the Kharif Season ... 438.720 acres

Crops	Area in acres	Percentage to the total cultivated land	Percentage to the net cropped land	Total percentage to the total cultivated land	Total percentage to the net cropped land
Grain Crops				53.08	90.15
Bulrush millet and pulses(pigeon pea)	199.000	26.71	45.36		
Maize	141.219	18.96	32.19		
Bulrush millet	19.156	2.57	4.36		
Big millet	14.251	1.91	3.25		
Big millet and pulses(pigeon pea)	13.844	1.86	3.16		
Rice (broadcast)	4.875	0.65	1.11		
Rice (transplanted)	3.156	0.42	0.72		
Other Crops				5.78	9.85
Sugarcane	18.438	2.48	4.20		
Sweet potato	14.406	1.93	3.29		
Vegetables	5.406	0.72	1.23		
Sannhemp	2.875	0.38	0.66		
Cotton	1.375	0.18	0.31		
Fodder	0.719	0.09	0.16		
Fallow	306.187	41.14		41.14	
Total ...	744.907	100.00	100.00	100.00	100.00



JUNAWAI
LAND UTILIZATION
KHARIF SEASON
1962
100 0 100 200
METRES
C COTTON
F FODDER
H SANNHEMP
M BIG MILLET
MI MAIZE
MII BULRUSH MILLET
P PULSES Pigeon Pea
R RICE (Transplanted)
r RICE (Broadcast)
S SUGARCANE
Sp SWEET POTATO
V VEGETABLES
FALLOW LAND
SETTLEMENT
ROAD (METALLED)
CART-TRACK
POND
WELL
WASTE LAND

FIG. 88

It will be seen from the Table that 53.08 per cent of the total cultivated land is cropped with grain crops while 5.78 per cent is under the non-cereal crops. Further, out of the net cropped land in the kharif season, 90.15 per cent is under grain crops and only 9.85 per cent under non-cereal crops in which sugarcane and sweet potato are major crops.

Among the grain crops, the biggest are the bulrush millet sown with pulses (pigeon pea) and maize. The cropping of rice is the least of all grain crops, which accompanies the overwhelming occupation of millets, pulses (pigeon pea) and maize upon the cropped land, being 88.32 per cent of the net cropped land in the kharif season. It is, of course, correlated with less rainfall in the kharif season.

Among the non-cereal crops, the sugarcane is grown where sufficient facilities of irrigation are available. But where the soil of the land is more sandy in texture, the crop of sweet potato flourishes well. The crop of vegetables is also grown considerably. The sannhemp, cotton and fodder crops are the smallest crops of the season.

A large part, 41.14 per cent of the total cultivated land, is left fallow in this season, which contributes much to medium quality lands in the village. The largeness of the fallowing indicates lack of fertility in the soil to some extent, and therefore it is left fallow for one or two seasons to recuperate the fertility.

LAND UTILIZATION IN THE RABI SEASON

The distribution of the various crops of the rabi season, 1962-63, and the other uses of land are shown in Fig.89. Table LXVIII gives a summary of each cereal and non-cereal crop. The percentages of each of them to the total cultivated land and to the net cropped land are given in Table LXVIII.

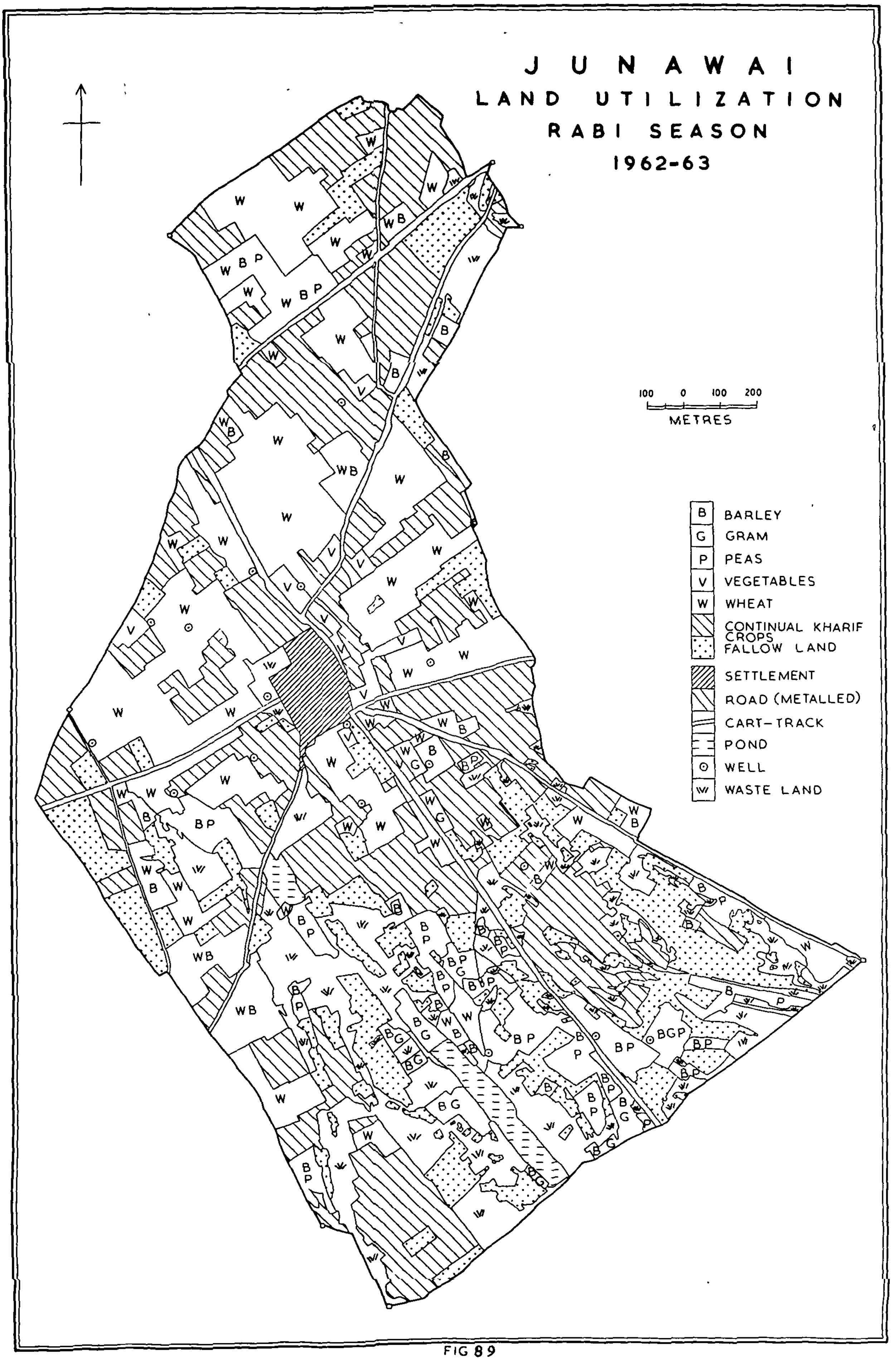

JUNAWAI
LAND UTILIZATION
RABI SEASON
1962-63
100 0 100 200
METRES
B BARLEY
G GRAM
P PEAS
V VEGETABLES
W WHEAT
CONTINUAL KHARIF CROPS
FALLOW LAND
SETTLEMENT
ROAD (METALLED)
CART-TRACK
POND
WELL
WASTE LAND

FIG 89

Table LXVIII

Total Cultivated Land ... 744.907 acres

Net Cropped land in the Rabi Season ... 294.630 acres

Crops	Area in acres	Percentage to the total cultivated land	Percentage to the total net cropped land	Total percentage to the total cultivated land	Total percentage to the net cropped land
Grain Crops				37.75	95.45
Wheat	168.188	22.58	57.08		
Barley-peas (mixed)	40.969	5.50	13.90		
Wheat-barley (mixed)	33.719	4.53	11.45		
Wheat-barley-peas (mixed)	11.313	1.51	3.84		
Barley-gram (mixed)	9.625	1.30	3.27		
Barley	6.969	0.93	2.37		
Barley-peas-gram (mixed	5.094	0.68	1.73		
Wheat-gram (mixed)	3.563	0.48	1.21		
Peas-gram (mixed)	1.781	0.24	0.60		
Other Crops				1.80	4.55
Vegetables	13.409	1.80	4.55		
Continual Kharif Crops	231.282	31.05		31.05	
Fallow	218.995	29.40		29.40	
Total ..	744.907	100.00	100.00	100.00	100.00

The Table reveals that 39.55 per cent of the total land under plough has been cropped in the rabi season. Out of the total cropped land in the rabi season, the 95.45 per cent is cultivated with the grain crops and only 4.55 per cent is under non-cereal crop (vegetables).

The largest proportion of the area is occupied by the continual kharif crops during the rabi season also, being 31.05 per cent of the total land under cultivation in the village.

Among the grain crops, wheat occupies the largest area, 57.08 per cent of the net cropped land; the other notable crops are barley-peas and wheat-barley (mixed) while cropping of gram mixed with either barley, peas or wheat is the smallest among the rabi crops. Besides wheat, which is mostly grown alone, the mixed cropping is a notable feature in the rabi season.

Most of the area under the continual kharif crops is occupied by pulses (pigeon pea) 28.57 per cent and only 2.48 per cent of the total cultivated land is under sugarcane crop.

The fallowing occupies the second largest area, being 218.995 acres or 29.4 per cent of the total land under plough. Both the area under continual kharif crops and fallow in the rabi season occupy 60 per cent of the total cultivated land. The shortage of rainfall in the rabi season and inadequate facilities of irrigation and manuring may be the predominant cause of large fallowing in the rabi.

There are no fodder or green manure crops in this season; it is because the fodder needs are fulfilled by the straw obtained from the rabi crops which suffices the need for about the whole or most of the year. In addition, the 'goula'[1] obtained from sugarcane harvest is also used as fodder during the rabi season.

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1. The green leaves of sugarcane obtained at its harvest are locally called 'goùla'; the dry leaves of sugarcane, 'patti', also obtained at the harvest—— may be a good source to prepare compost manure.

DOUBLE CROPPED LAND

The double cropped land of the village is shown in Fig.90. The area under double cropping is 165.00 acres or 22.15 per cent of the total cultivated area of the village. All the double cropped area possesses good (A) quality land. The area under double cropping may slightly vary from year to year in accordance with the increase or decrease of application of manure and irrigation to the land. The double cropped land per head of population is 0.199 acre.

ROTATION OF CROPS

The differences among rotations of crops in the village exist on account of many considerations, for instance, consideration for fluctuations in rainfall, differences of fertility and character of the soil, availability of irrigation and qualitative and quantitative provisions of mauring. However, there are no hard and fast rules of crop rotations. The need of the cultivator plays an important role in certain rotations. Yet there are no big differences of crop rotations in villages of a particular type of land. The usual rotations of crops are as follows:

Crop year	Kharif season	Rabi season
First year	Maize/ sugarcane	Wheat/sugarcane (contd.)
Second year	Maize/millets/sugarcane(contd.)	Wheat/wheat peas/sugarcane
Third year	Millets/maize	Barley peas/wheat-barley

The above mentioned rotation of crops is related to the good quality (A) lands. But the BI quality lands have generally some different rotations. The BI quality lands, having sandy loam soil, cropped in either the kharif or the rabi season while the other season is left for fallowing; fallowing sometimes continues for two seasons.

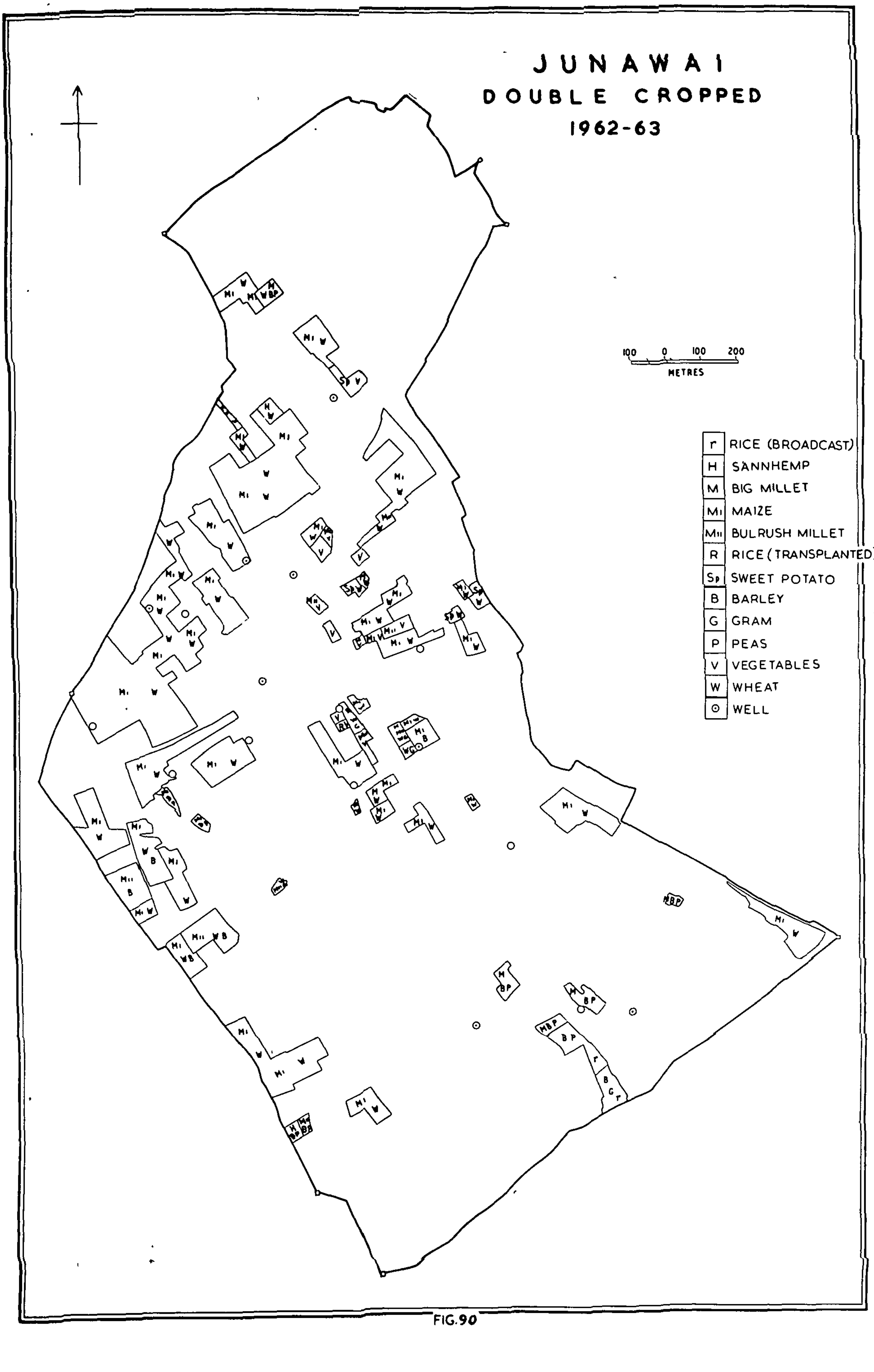
JUNAWAI
DOUBLE CROPPED
1962-63
100 0 100 200
METRES
r RICE (BROADCAST)
H SANNHEMP
M BIG MILLET
Mi MAIZE
Mii BULRUSH MILLET
R RICE (TRANSPLANTED)
Sp SWEET POTATO
B BARLEY
G GRAM
P PEAS
V VEGETABLES
W WHEAT
WELL

FIG.90

Crop year	either in Kharif season	or	in Rabi season
First year	Maize	or	Wheat
Second year	Bulrush millets/maize	or	Barley/wheat barley/peas
Third year	Bulrush millet mixed with pulses		pulses (continual kharif crop

The rotation of crops in the BII quality lands, which have heavier soil as compared to other soils, is generally as follows:

Crop year	either in Kharif season	or	in Rabi season
First year	Rice (transplanted)	or	Gram (alone or mixed with wheat)
Second year	Rice (transplanted or broadcast)	or	Gram/gram-wheat/gram peas
Third year	Rice (broadcast)	or	Gram-wheat-barley/gram-wheat-peas

A crop in the BII type of land is grown in either the kharif or the rabi season, and the other season is meant for fallowing. The land may be left fallow for two or three continuous seasons.

The outstanding feature of the crop-production in the village is the largest cropping of those grain crops which require less water and sandy loam soil, as bulrush millet and big millet with or without pulses, maize, wheat, barley and peas. Most of the A and BI quality lands are devoted to these crops.

LAND USE AND POPULATION

The total population dependent upon the produce of the village is 829. Table LXIX shows the per capita share in the total land, total cultivated land, net sown area in the kharif as well as in the rabi seasons, gross cultivated land and the double cropped land.

Table LXIX

The Population of Village Junawai .. 829
(Area in acres)

	Total area of the village	Total cultivated land [1] available	Net cropped land in the kharif season	Net cropped land in the Rabi season	Gross cultivated land (both of kharif and rabi seasons)	Double cropped land
	864.875	744.907	438.720	294.630	733.350	165.000
Land per head of population	1.043	0.899	0.529	0.355	0.885	0.199

It will be seen from the Table that per capita share of total land available for cultivation is 0.899 acre; and this amount decreases to 0.529 acre in the net cropped land in the kharif season owing to largest fallowing. The per capita share of the cropped land still decreases to 0.355 acre in the rabi season due to large fallowing and large occupation of land by the continual kharif crops, being 31.05 per cent of the total cultivated land.

The gross cultivated land of kharif and rabi seasons per head of population amounts to be 0.885 acre; the amount of land which actually supports one person in the village is thus 0.885 acre. On the other hand, the per capita share of the double cropped land is 0.199 acre.

1. It includes 176.557 acres of land under annual fallowing.

Out of the total population, 96.4 per cent is the primary rural or the cultivators while the rest are secondary rural who are dependent upon the produce of the cultivating class through their subsidiary services to the former; they include shop keepers, carpenter-cum-ironsmith, tailor and potters.

CALORIC INTAKE

The per acre yields of various crops may vary from year to year due to differences of soil preparations, changes in rainfall conditions, deficient or sufficient manuring and irrigation and the weeding and seeding. However, the yields per acre of various crops of the kharif and rabi seasons in the village are generally as in Table LXX A.

The total production of food crops in the village, the amount of food exported from the village, the net food extracted, and the actual amount of food intake in terms of calories per head per day are calculated in Table LXX B.

Table B shows that the villagers, who export a part of their field-produce to meet their other necessities, have a daily intake of 1960 calories from food which indicates undernutrition.

The largest caloric intake is from wheat, followed in order by maize, bulrush millet, pulses (pigeon pea), sugar (gur) and barley-peas mixed. Other crops are minor. Sweet potato is the second non-grain food which provides a considerable amount of calories to the diet.

Table LXX A

Crops	Yield per acre (in kilograms)
Bulrush millet (when sown with pulses)	131
Pulses (pigeon pea) (when sown with millets)	93
Maize	261
Bulrush millet (sown alone)	224
Big millet (sown alone)	224
Big millet (sown with pulses)	130
Rice (broadcast) unhusked	318
Rice (transplanted) unhusked	354
Canesugar	933
Sweet potato	1,679
Wheat	336
Barley	338
Barley-peas (mixed)	373
Gram-peas (mixed)	299
Wheat-gram (mixed)	263
Barley-gram (mixed)	263
Wheat-barley-peas (mixed)	361
Gram-barley-peas (mixed)	312

Table LXX B

FOOD BALANCE SHEET

VILLAGE JUNAWAI
(in kilograms)

Population... 829 Year 1962-63

Commodity	Production	Total Production	Export	Import	Available Supply	Seed	Feed (Gross)	Extraction rate per cent	Feed (net)	Per head Consumption Kilograms per year	Grams per day	Calories per day
Bulrush millet (sown with pulses)	33432.0	39159.6	8615.1	-	30544.5	813.9	29730.6	95	27244.1	32.864	90.0	313.2
Bulrush millet (sown alone)	5727.6											
Maize	47449.6	47449.6	10000.0	-	37449.6	1186.2	36363.4	89	32363.4	39.039	106.9	380.6
Big millet	4261.0	6586.8	1646.7	-	4940.1	117.7	4822.4	95	4581.3	5.526	15.1	51.8
Big millet (sown with pulses)	2325.8											
Pulses (sown with millets)	23838.5	23838.5	3973.1	-	19865.4	297.9	19567.5	95	18589.1	22.424	61.4	210.6
Rice (broadcast)	1550.3	1550.3	-	-	1550.3	136.5	1413.8	66 2/3	942.5	1.137	0.3	1.1
Rice (transplanted)	1117.2	1117.2	-	-	1117.2	29.5	1087.7	66 2/3	725.1	0.875	2.4	8.6
Sugar (gur)	17202.7	17202.7	458.7	-	16744.0	1548.4	15195.6		15195.6	18.330	50.2	176.2
Sweet potate	24187.9	24187.9	7387.0	-	16800.9	-	16800.9	83	13944.7	16.821	46.1	44.7
Wheat	56511.2	56511.2	-	-	56511.2	7063.9	49447.3	90	44502.6	53.682	147.1	491.3
Barley and peas	15281.4	15281.4	-	-	15281.4	1802.6	13478.8	82	11052.6	13.332	36.5	123.7
Wheat and barley	11363.3	11363.3	-	-	11363.3	1416.2	9947.1	80	7957.7	9.599	26.3	87.6
Wheat-barley-peas	4083.9	4083.9	-	-	4083.9	486.5	3597.4	85	3057.8	3.689	10.1	34.1
Barley-gram	2531.4	2531.4	-	-	2531.4	404.3	2127.1	82	1744.2	2.104	5.8	20.0
Barley	2355.5	2355.5	-	-	2355.5	292.7	2062.8	70	1443.9	1.742	0.5	1.7
Barley-peas-gram	1589.3	1589.3	-	-	1589.3	225.8	1363.5	86 2/3	1181.7	1.425	0.4	1.4
Wheat-gram	937.1	937.1	-	-	937.1	149.6	787.5	92	724.5	0.874	2.4	8.3
Peas-gram	532.5	532.5	-	-	532.5	78.9	453.6	95	430.9	0.520	1.4	4.9
Total												1959.8

POTENTIAL PRODUCTION UNIT

Considering the various yield-rates of crops, the different types of agricultural lands and unproductive lands in the village have been evaluated to ascertain their potential productivity. Table LXXI gives the relative ratings of each of them in the following. The total numbers of Potential Production Units, as computed for each of them, are also given in the Table

Table LXXI

Average Yield per acre of Normal Standard Farmland in the Village: 306 kilograms or 1 P.P.U.

Type of land	Area in acres	Average yield per acre in kilograms	Productivity rating per acre	Number of P.P.U.
A	183.438	429	1.402	257.180
BI	542.532	306	1.000	542.532
BII	18.937	299	0.977	18.501
C	65.625	0	0	0
Total ..	810.532			818.213

The Table indicates that the total number of Potential Production Units is greater than the total amount of productive and unproductive lands in the village. It is partly due to the considerable proportion of good quality (A) lands which have the largest amount of average yield per acre, including that of sugarcane.

The BI medium quality lands of the village have the normal standard productivity which is equal to 1 P.P.U. per acre. The BII medium quality lands, which have small area, are comparatively inferior to the BI lands.

The poor quality (C) lands have no crop production hence no P.P.U. This has considerably decreased the average number of P.P.U. per acre for the whole village.

However, the productive efficiency of BI lands may be raised to tha of the good quality lands if the application of manuring and irrigation are sufficiently extended. Similarly, the productivity rating per acre of a considerable part of BII lands may be raised. The increase in both manurin and irrigation to the cultivated land givesthe best crop-yields. Inadequate supply of any of them to the land, when cropped, results in decreasing fertility and low productivity of crops.

LAND UTILIZATION IN VILLAGE BICHOULA

LOCATION

Village Bichoula, situated in Tahsil Sahaswan, district Budaun, lies at 28°3'15"N lat. and 78°57'58"E long. (Fig.91). It is bounded by the villages Banbihta in the northwest, Akauli, in the northeast, Baghaul in the west and the large village of Risauli in the south-southeast. The land of this area has a gentle slope from northwest to southeast. The boundaries of the village Bichoula are very irregular ? uneven.

CLIMATE

No climatic data are available for the village but, since it lies only 7 kilometres away from rainfall recording station of Sahaswan, the rainfall data of Sahaswan may be taken as almost correct to the general conditions of the village. Table LXXII indicates the distribution of rainfall in Sahaswan in the *kharif* season,1962.

Table LXXII

Kharif Season, 1962 .. (Sahaswan)

	MONTHS					
	June	July	Aug.	Sept.	Oct.	Total
Rainfall in millimetres in the kharif season,1962	63.0	181.4	119.9	252.0	-	616.3
Rainy days in kharif,1962	5	13	8	12	-	
Average rainfall in millimetres	81.0	234.0	262.3	142.6	45.7	765.6

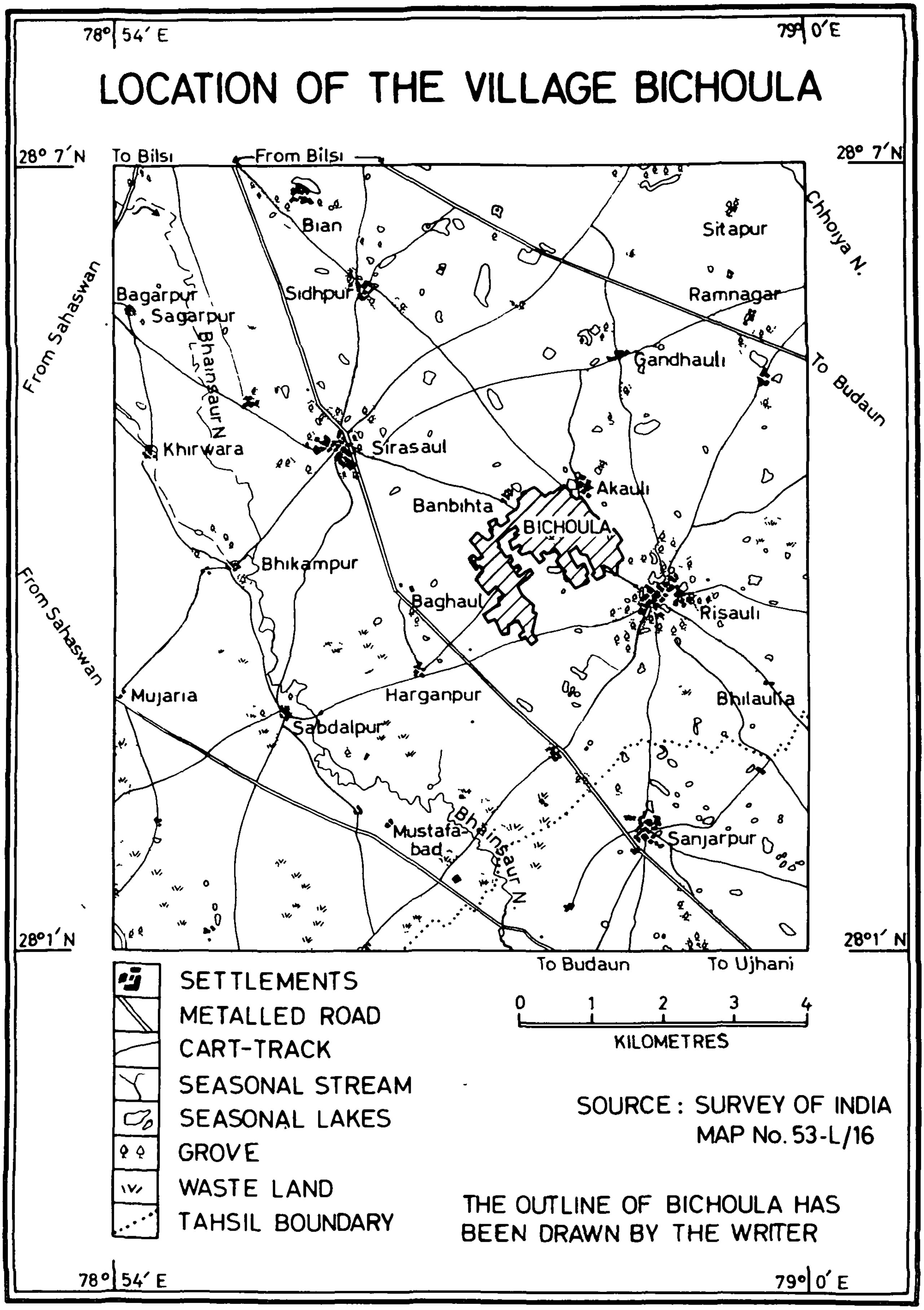
78° 54′ E
79° 0′ E
LOCATION OF THE VILLAGE BICHOULA
28° 7′ N
To Bilsi
From Bilsi
Chhoiya N.
Bian
Sitapur
From Sahaswan
Bagarpur
Sagarpur
Sidhpur
Ramnagar
Bhainsaur N.
Gandhauli
To Budaun
Khirwara
Sirasaul
Akauli
Banbihta
BICHOULA
Bhikampur
Baghaul
Risauli
From Sahaswan
Mujaria
Harganpur
Bhilaulia
Sabdalpur
Mustafabad
Bhainsaur N.
Sanjarpur
28°1′ N
To Budaun
To Ujhani
SETTLEMENTS
METALLED ROAD
CART-TRACK
SEASONAL STREAM
SEASONAL LAKES
GROVE
WASTE LAND
TAHSIL BOUNDARY
0 1 2 3 4
KILOMETRES
SOURCE : SURVEY OF INDIA
MAP No. 53-L/16
THE OUTLINE OF BICHOULA HAS
BEEN DRAWN BY THE WRITER
78° 54′ E
79° 0′ E

FIG. 91

It is evident from the Table that total rainfall in kharif season has been below average ~~due~~ owing to shortage of rainfall in first three months of the season, particularly in August, which was followed by excessive rainfall in September, sufficiently more than its average; but October was rainless.

The rainfall distribution in the rabi season, is given in Table LXXIII.

Table LXXIII

Rabi Season, 1962-63 .. (Sahaswan)

	MONTHS					
	Nov.	Dec.	Jan.	Feb.	March	Total
Rainfall in millimetres in the rabi season, 1962-63	-	-	24.6	10.2	5.0	39.8
Rainy days in rabi, 1962-63	-	-	2	1	2	
Average rainfall in millimetres	1.75	6.1	20.3	20.5	10.0	58.7

The above Table shows that total rainfall in the rabi season has been below average, due to absence of rainfall in first two months of the season. January received good rainfall as compared to the monthly average. But the months of February and March experienced shortage of rainfall, being half of their averages.

LAND CLASSIFICATION

In accordance with fertility and productivity, the fields of the village have been classified in Fig. 92. The predominant soil of the lands in the village is sandy loam. It covers an area of 253.299 acres or 76.5 per cent of the total land under cultivation. This category of land is of medium quality; it is cultivated in either the kharif season or the rabi season and is left fallow for the other season. Occasionally the fallowing is done for two or three seasons also. This type of land is often put to crops of millets, pulses, maize, barley or peas.

The good quality (A) land[1] is found in 73.094 acres or 22.1 per cent of the total cultivated land in the village. It has well-drained and ferti[l] soil, often irrigated from wells and ponds. Both kharif and rabi crops are raised in this type of land. Sugarcane is also cultivated in it, which doe[s] not give as much yield in other soils as in it.

IRRIGATION

The cultivated irrigated and unirrigated portions of the cultivated lands have been demarcated in Fig. 93. The irrigation in kharif is that of only sugarcane. The area irrigated in rabi season is large due to shortage of rainfall in the rabi season (see Table LXXIII). The sources of irrigati[on] in the village are only ponds and wells. Sugarcane has been irrigated in kharif season, owing to its greater water requirements and shortage of seasonal rainfall in the kharif season.

In the rabi season, the first two months are completely rainless (Table LXXIII). The total seasonal rainfall remained very scanty (39.8 mm), rendering irrigation necessary for the rabi crops.

---

1. The soil of good quality (A) lands is locally termed as 'gauhani', while the land under vegetable crops is known as 'kachhiana', their cultivator are known as 'muraos'.

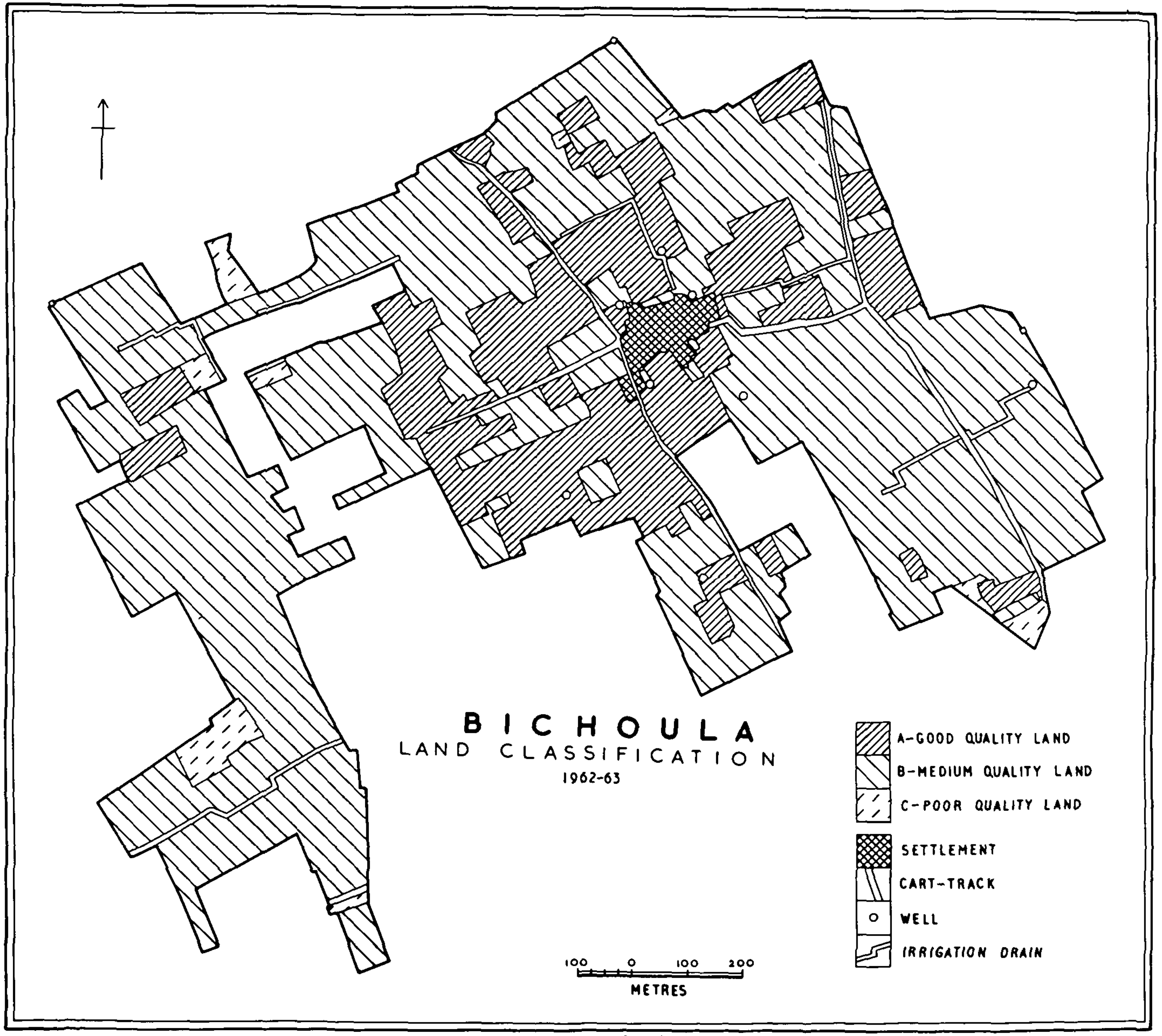
BICHOULA
LAND CLASSIFICATION
1962-63
A-GOOD QUALITY LAND
B-MEDIUM QUALITY LAND
C-POOR QUALITY LAND
SETTLEMENT
CART-TRACK
WELL
IRRIGATION DRAIN
100 0 100 200
METRES

FIG 92

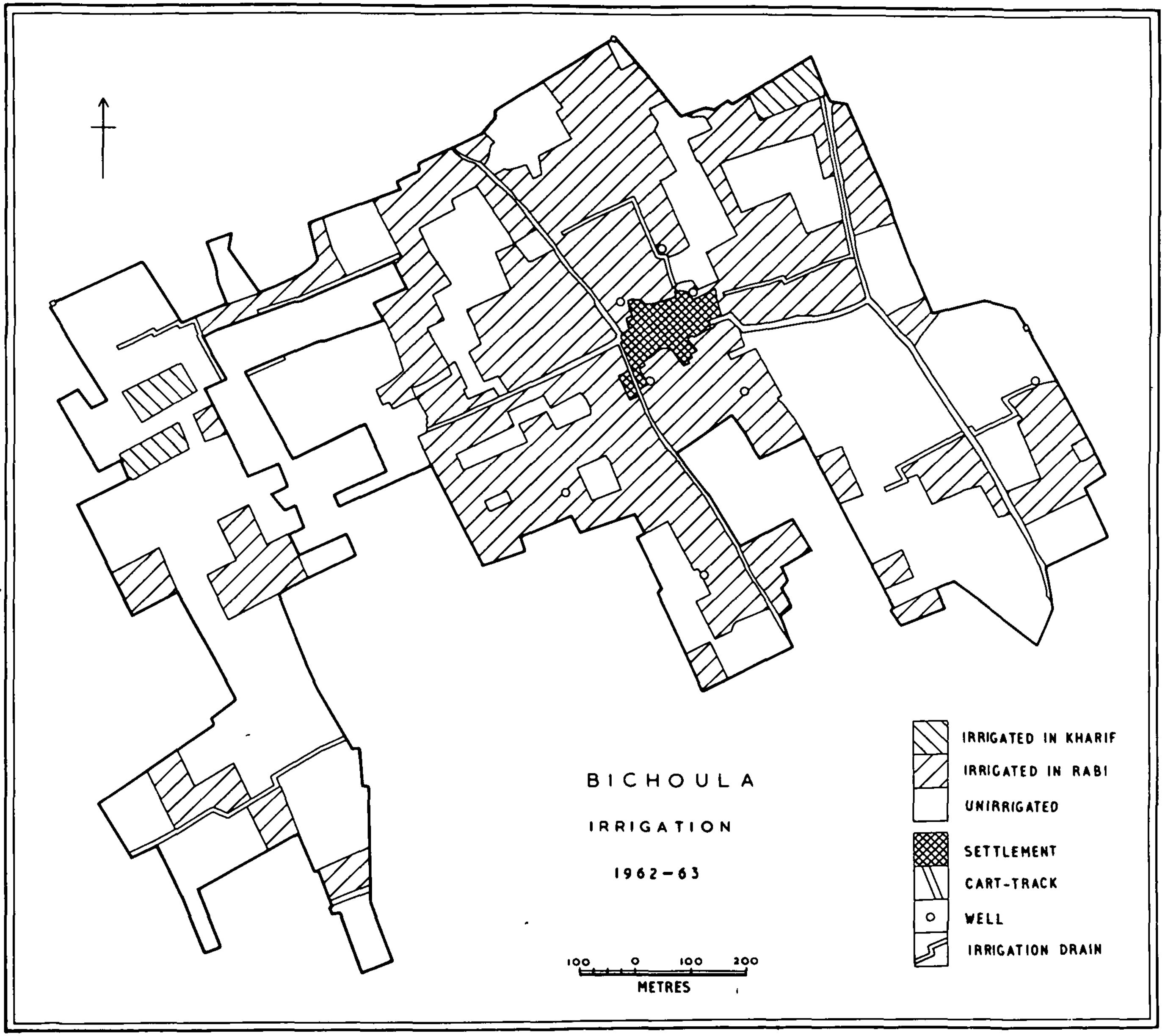
BICHOULA
IRRIGATION
1962–63
IRRIGATED IN KHARIF
IRRIGATED IN RABI
UNIRRIGATED
SETTLEMENT
CART-TRACK
WELL
IRRIGATION DRAIN
100 0 100 200
METRES

FIG 93

Where the facilities of irrigation are inadequate, the crops of barley peas and pulses can be grown. The crops of wheat, gram and vegetables are generally irrigated while other crops are only occasionally irrigated.

Irrigation from ponds can only be done to the field lying near the pond when irrigation from wells can be done to the distant fields also. Non-masonry wells, dug temporarily at times of need are also useful. The depth of underground water-table remains at about 5 metres during the cold weather (rabi) season. Only half acre is generally irrigated in 12 hours from either a pond or a masonry well, where both Persian wheels and '<u>charas</u>'[1] are used.[2]

LAND UTILIZATION

Fig.94 shows all types of uses of land in the village in the year 1962-63. The area shared by each type of land alongwith its percentage to the total area of the village is given in Table LXXIV.

Table LXXIV

Total area of the Village ... 344.09 acres

Use of Land	Area in acres	Percentage to the total area
Cultivated land	326.393	94.86
Waste land	7.395	2.15
Cart-track	4.219	1.22
Settlement	5.516	1.60
Grove	0.281	0.08
Irrigation channel	0.286	0.09
Total ...	344.090	100.00

1. '<u>charas</u>' is the local term for irrigation from wells with the help of 'rope and leather bucket' drawn by bullocks.
2. The cost of irrigation per acre in the year of inquiry was Rs 17/- from masonry well and Rs 12/- from a pond.

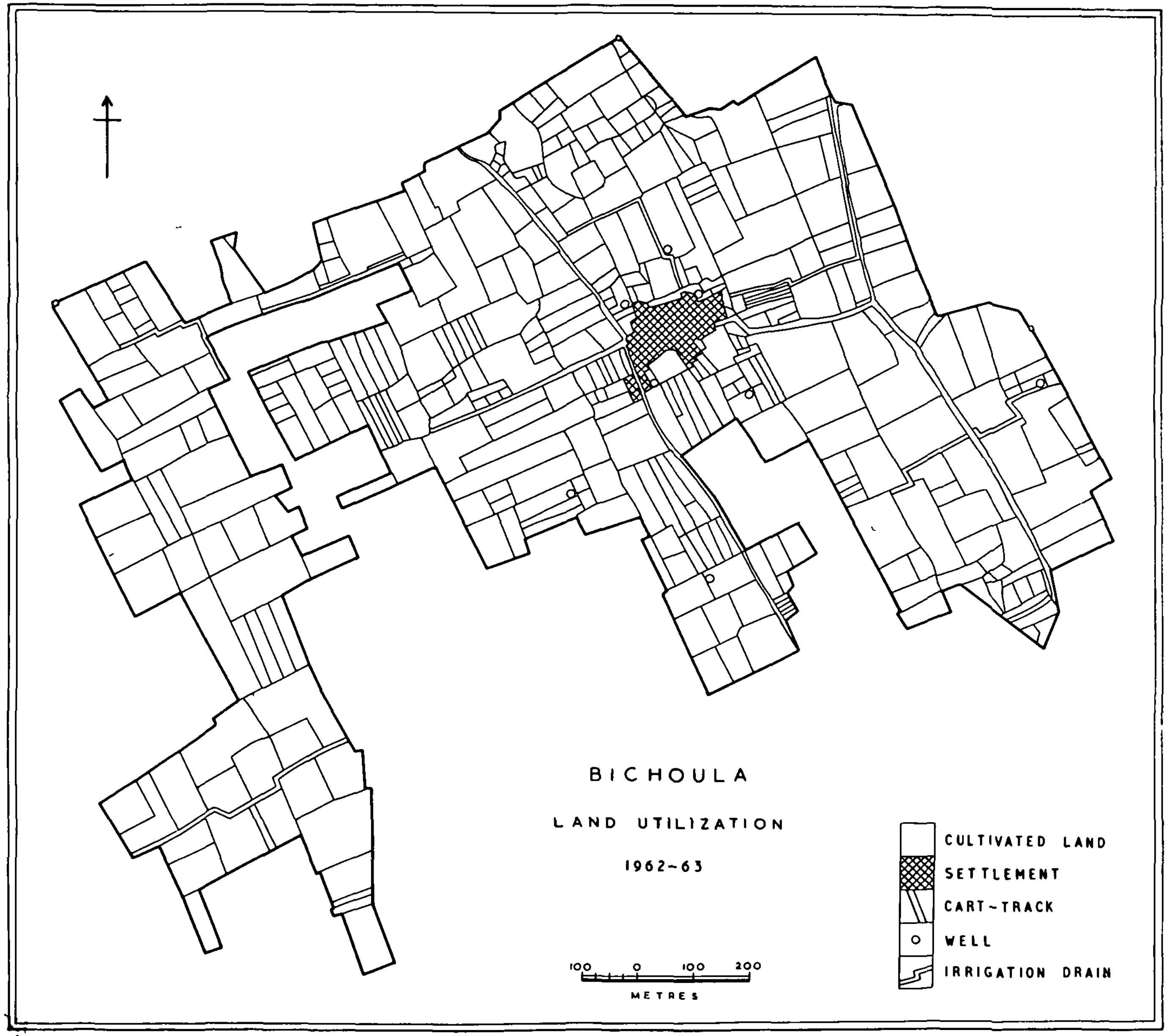
BICHOULA
LAND UTILIZATION
1962-63
100 0 100 200
METRES
CULTIVATED LAND
SETTLEMENT
CART-TRACK
WELL
IRRIGATION DRAIN

FIG 94

The Table shows that the cultivated land in the village covers 94.86 per cent area, while the total of other lands is only 5.14 per cent of the village. The fuel supply to the village from groves is quite insufficient, hence for household fuel purposes, the dung-cakes are generally used. The poor quality (C) land in the village is 2.15 per cent. The fields in good quality lands are comparatively smaller in size than those of the other types of lands. Most of the fields in the cultivated area are rectangular in shape. The village boundaries are quite irregular, particularly in the western part.

LAND UTILIZATION IN THE KHARIF SEASON

Fig. 95 shows the distribution of crops and other occupation of land in the _kharif_ season of 1962. Table LXXV gives a summary of the area occupied by each crop and its percentages to the total cultivated land and to the net cropped land.

The Table shows that 53.88 per cent of the total cultivated land of the village has been cropped in the _kharif_ season, constituting 49.54 per cent under grain crops and only 4.34 per cent under non-cereal crops. It is seen that a large area, 46.12 per cent of the total cultivated land, remained fallow in the kharif season. It may partly be due to shortage of rainfall in the sowing period of the season, June to August (Table LXXII) when the shortage amounted collectively to 213 millimetres from their average.

Table LXXV shows that the grain crops occupied 91.95 per cent of the net cropped land in the kharif season, 1962, while non-cereal crops occupied only 8.05 per cent. Only the crops of millets, alone and mixed with '_arhar_' (pigeon pea), occupied largest (69.67 per cent) area of the net cropped land in the season. In addition, only maize occupied 18.92 per cent of the net cropped land. Both the crops, constituting 88.59 per cent of the net sown area, are satisfactorily grown in the season.

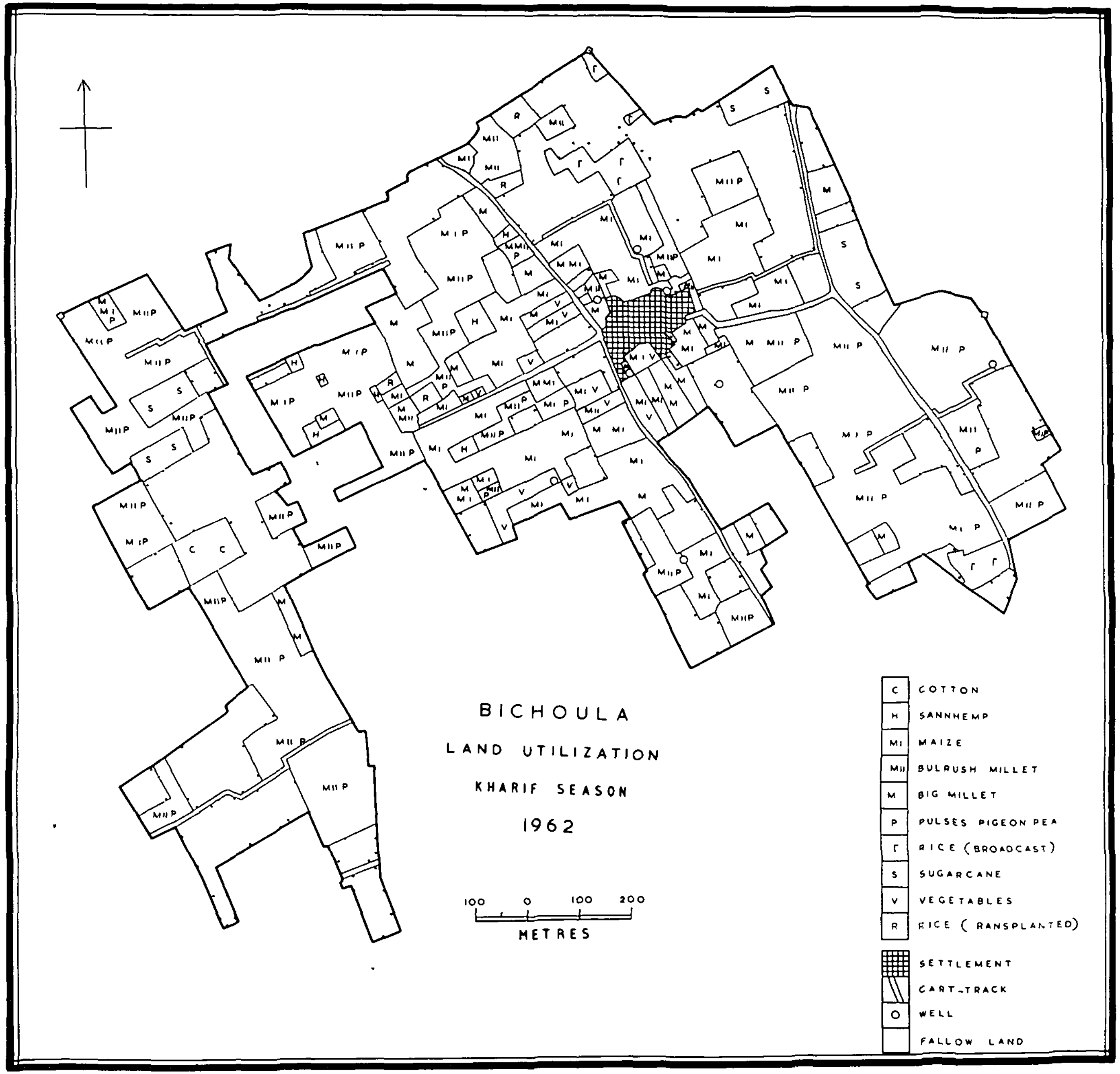
BICHOULA
LAND UTILIZATION
KHARIF SEASON
1962
100 0 100 200
METRES
C COTTON
H SANNHEMP
Mi MAIZE
Mii BULRUSH MILLET
M BIG MILLET
P PULSES PIGEON PEA
r RICE (BROADCAST)
S SUGARCANE
V VEGETABLES
R RICE (RANSPLANTED)
SETTLEMENT
CART-TRACK
WELL
FALLOW LAND

FIG 95

Table LXXV

Total Cultivated Land ... 326.393 acres

Net Cropped Land in the Kharif Season ... 175.840 acres

Crops	Area in acres	Percentage to total cultivated land	Percentage to net cropped land	Total percentage to the total cultivated land	Total percentage to the net cropped land
<u>Grain Crops</u>				49.54	91.95
Bulrush millet and pulses (pigeon pea)	108.683	33.30	61.80		
Maize	33.261	10.19	18.92		
Big millet	10.622	3.25	6.04		
Rice (transplanted) unhusked	3.379	1.04	1.92		
Rice (broadcast) unhusked	2.536	0.78	1.44		
Big millet and pulses (pigeon pea)	1.909	0.58	1.09		
Bulrush millet	1.294	0.40	0.74		
<u>Other Crops</u>				4.34	8.05
Sugarcane	5.563	1.70	3.17		
Vegetables	4.437	1.36	2.52		
Cotton	3.906	1.20	2.22		
Sannhemp	0.250	0.08	0.14		
<u>Fallow</u>	150.553	46.12		46.12	
Total ..	326.393	100.00	100.00	100.00	100.00

Rice, which has greater water requirement than other cereal crops has an area of only 3.36 per cent of net cropped land; similarly, sugarcane also has only 3.17 per cent of the net cropped area. The non-cereal crops include vegetables, sugarcane, cotton and sannhemp. The crop of pulses '<u>arhar</u>' (pigeon pea), which is best suited to deficient- rainfall conditions, cover an area of 110.592 acres or 62.89 per cent of the net sown area. In the village, the '<u>arhar</u>' crop is generally sown alongwith mellets.

Among non-cereal crops, sugarcane is the largest occupying only 1.7 per cent of the total cultivated land. It is due to sandy loam texture of the soil, shortage of rainfall and inadequate sources of irrigation in the village. Medium quality lands are generally devoted to the crops of millets, pulses and rice. The lands under fallowing are also included in medium quality lands. There is no fodder or green manure crop, except sahnhemp which has the least area in all kharif crops. Much of the sannhemp is used for hemp and fuel purposes.[1]

LAND UTILIZATION IN THE RABI SEASON

Agricultural and other uses of land in the rabi season, 1962-63, are depicted in Fig. 96. Table LXXVI gives a summary of the area occupied by each crop and its percentages to the total cultivated land and to the net cropped land in the <u>rabi</u> season.

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1. The bark of the '<u>sann</u>' plant is drawn for hemp and the rest of the stems are dried and used as fuel in household purposes.

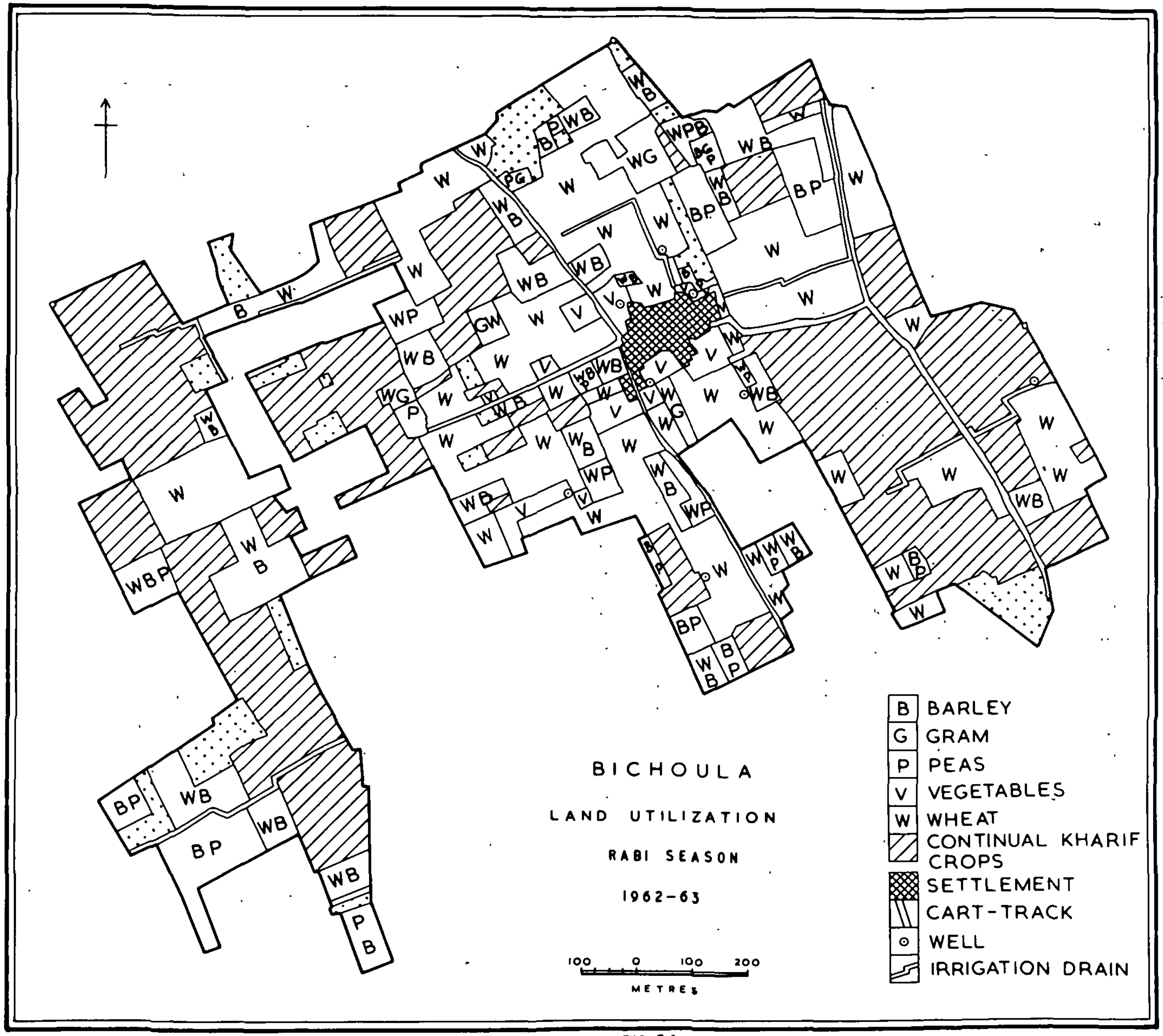
BICHOULA
LAND UTILIZATION
RABI SEASON
1962-63
B BARLEY
G GRAM
P PEAS
V VEGETABLES
W WHEAT
CONTINUAL KHARIF CROPS
SETTLEMENT
CART-TRACK
WELL
IRRIGATION DRAIN
100 0 100 200
METRES

FIG. 96

Table LXXVI

Total Cultivated Land ... . 326.393 acres

Net Cropped Land in the Rabi Season ... 183.776 acres

Crops	Area in acres	Percentage to the total cultivated land	Percentage to net cropped land	Total percentage to the total cultivated land	Total percentage to net cropped land
Grain Crops				53.48	94.98
Wheat	103.594	31.74	56.37		
Wheat and barley	36.540	11.20	19.90		
Barley and peas	18.000	5.51	9.80		
Wheat and gram	5.563	1.70	3.03		
Peas and gram	1.656	0.51	0.90		
Wheat and peas	4.000	1.23	2.17		
Barley,gram and peas	0.828	0.25	0.43		
Barley	0.469	0.14	0.26		
Wheat,barley and peas	3.907	1.20	2.12		
Other Crops				2.82	5.02
Vegetables	9.219	2.82	5.02		
Fallow	30.681	9.40		9.40	
Continual kahrif crops	111.936	34.30		34.30	
Total ..	326.393	100.00	100.00	100.00	100.00

It will be seen from the above Table that 56.30 per cent of the total cultivated land is under various crops of the rabi season. Fallowing practice in the rabi season being 9.4 per cent of the total cultivated land, is about one fifth of the kharif fallowing.

Out of the net cropped land in the rabi season, the 94.98 per cent land is under cereal crops including 56.37 per cent under wheat only. The next crop of the season is of wheat-barley mixed (19.9 per cent). However, a good proportion of the net cropped land (38.35 per cent) is under mixed crops of wheat, barley, peas and gram.

The only non-cereal crop in the village during the rabi season is of vegetables which occupies only 5.02 per cent of the net cropped land. The continual kharif crops occupying 34.3 per cent of the total land under cultivation are kharif pulses (arhar-pigeon pea) and sugarcane.

DOUBLE CROPPED LAND

The fields cropped in both the kharif and rabi seasons in the year 1962-63, are shown in Fig.97. The area of the double cropped land in the village is 67.531 acres being 20.4 per cent of the total cultivated land in the village. It is 0.207 acre per head of village population (Table LXXVII). Double cropping in the villlge is small. The soil of the double cropped land is of good (A) quality. The area under double cropping may change from year to year in accordance with the less or sufficient provisions of manures or fertilizers and irrigation. A land put to fallowing in one season, may, after manuring, be cropped twice next year; and vice versa.

ROTATION OF CROPS

The kharif crops of maize, millets and rice are generally replaced by wheat,barley, peas and gram in the rabi season. The crops of maize, big millet, wheat, barley are dominant in the double cropping generally. The crop rotations are not permanent. The choice of crops depends generally on availability of manure and irrigation and the needs of the cultivators. General rotations are as in the previous village, Junawai.

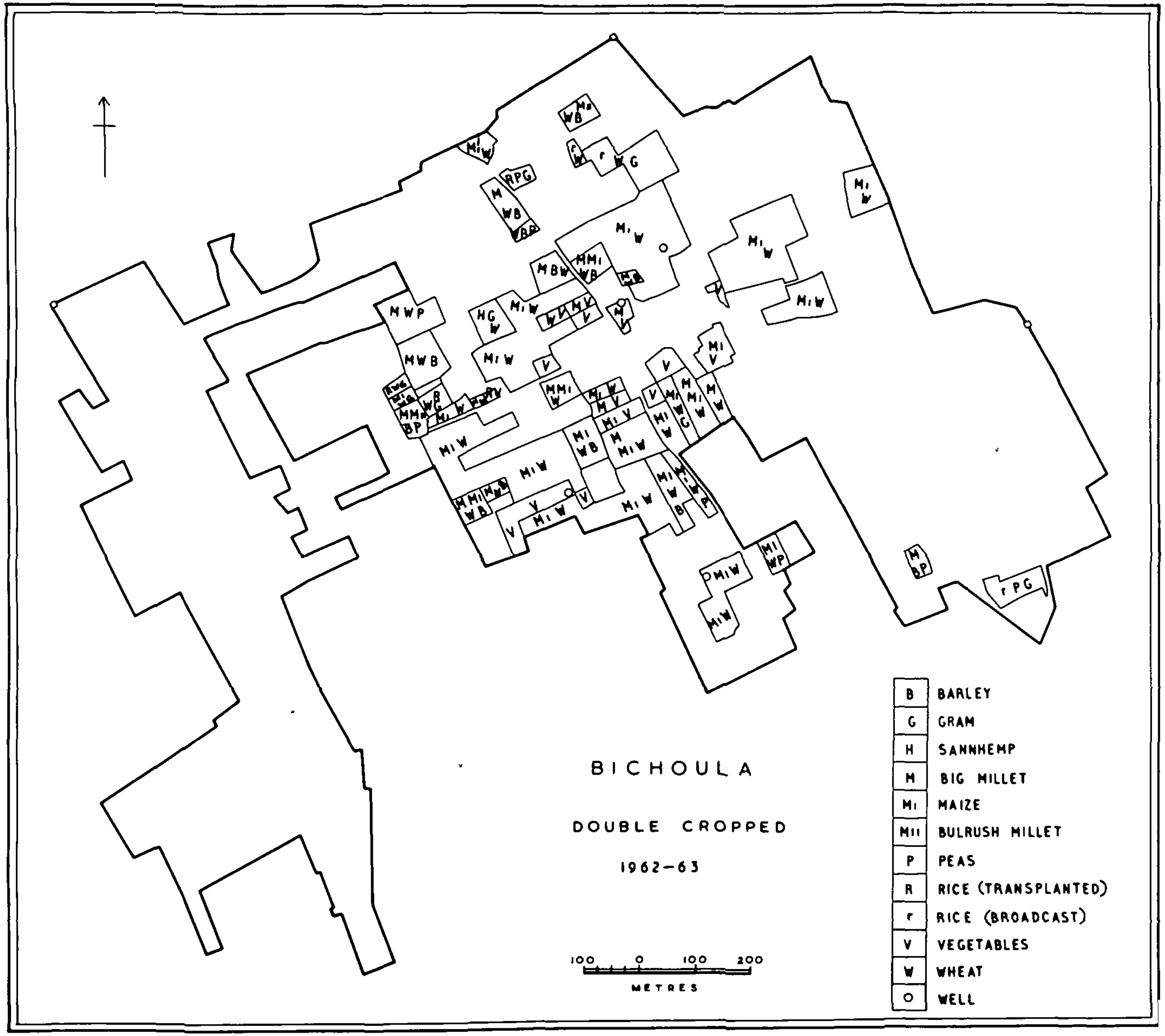
BICHOULA
DOUBLE CROPPED
1962–63
B BARLEY
G GRAM
H SANNHEMP
M BIG MILLET
Mi MAIZE
Mii BULRUSH MILLET
P PEAS
R RICE (TRANSPLANTED)
r RICE (BROADCAST)
V VEGETABLES
W WHEAT
O WELL
100 0 100 200
METRES

FIG. 97

The fertility of a soil may suffer from ill-rotation of crops. The land under cereal crops during a continuous number of years decreases the nitrogen content of the soil. After crops of millets, the production of non-leguminous crops gives very low returns. It is why millets are mostly grown with 'arhar' (pigeon pea), a leguminous crop, which continues to occupy the land in the coming rabi season also. The non-leguminous cereal crops of rabi season preceded by only millets give low yields. The consumption of potash by bulrush millet and big millet per acre per season is 90 and 72 lbs. respectively in addition to 16 lbs. of phophorous.[1]

The crops of vegetables are mostly rotated with vegetables because the land cropped with vegetables, though very small, is intensively manured and irrigated, hence the good yields; and secondly due to good market-prices of early yielding vegetables.

LAND USE AND POPULATION

Total population of the village Bichoula is 327. The total and the per capita share of each of the cultivated land, net cropped land in the kharif and in the rabi seasons, gross cultivated land and the double cropped land are given in Table LXXVII.

Table LXXVII

Total Population of Village Bichoula .. 327
(Areas are in acres)

	Total area of the village	Total cultivated land available[2]	Net cropped land in the kharif season	Net cropped land in the rabi season	Gross cultivated land (both of kharif and rabi)	Double cropped land
	344.09	326.393	175.840	183.776	359.616	67.531
Land per head of population	1.05	0.998	0.537	0.562	1.099	0.207

1. Arakeri, H.R., Chalam, G.V. and Satyanarayana, op.cit. p.175.
2. It includes 34.308 acres of agricultural land being under annual fallowing.

It will be seen from the Table that the per capita total cultivated land available is 0.998 acre but due to large fallowing in the kharif season it is reduced to 0.537 acre. It is slightly increased in the rabi season to 0.562 acre owing to great decrease in fallowing but occupation of large area by the continual kharif crops during the rabi season.

The gross cultivated land, however, gives a share of 1.099 acres per head of village population; and this is the actual amount of land supporting one person in the village Bichoula. The double cropping in the village is small and the per capita share is only 0.207 acre.

Out of the total population, 99 per cent are cultivators or the primary rural[1] in the village and the rest are secondary rural.[2]

CALORIC INTAKE[3]

Table LXXVIII A gives the yield of various crops grown in the kharif and rabi seasons. The total production of different crops in the village has been calculated and an attempt has been made to assess the total caloric intake per head per day in the food balance sheet of the village (Table LXXVIII B).

The village is not self-sufficient with respect to caloric consumption The village, however, exports some of its produce to other villages to meet other needs.

Table LXXVIII B expresses that the villagers have less food provision as compared to the villages of loamy soil. The largest caloric intake per head per day is from wheat, followed by bulrush millet, pulses and mixed

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1. The primary rural population is locally called as '<u>murao</u>' or '<u>kachhi</u>'.
2. The writer did not find any adventitious person in the village.
3. The yield rates were known in maunds and seers and were converted into kilograms by the writer.

Table LXXVIII A

Yield of Crops in Village Bichoula, 1962-63

Crops	Yield per acre (in kilograms)
Bulrush millet[1] (when sown with pulses)	190
Pulses (when sown with millets)	112
Maize	302
Big millet (when sown alone)	242
Rice (transplanted) unhusked	373
Rice (broadcast) unhusked	373
Big millet (when sown with pulses)	187
Bulrush millet (sown alone)	242
Cane sugar (gur)	1,140
Wheat	373
Barley	428
Barley and peas[2] (mixed)	410
Wheat-barley-peas	410
Wheat-peas (mixed)	410
Barley-peas-gram (mixed) '<u>bejhar</u>'	362
Wheat-gram (mixed) '<u>gochani</u>'	350
Peas-gram (mixed)	391
Wheat-barley (mixed) '<u>gojhi</u>'	401

1. Locally known as '<u>bajra</u>'
2. Peas or gram are <u>not generally</u> sown alone.

Table LXXVIII B

FOOD BALANCE SHEET

VILLAGE BICHOULA

(in kilograms)

Population ... 327 Year 1962-63

Commodity	Production	Total Production	Export	Import	Available Supply	Seed	Food (Gross)	Extraction rate per cent	Food (net)	Per head Consumption Kilograms per year	Grams per day	Calories per day
Bulrush millet (sown with pulses)	20649.8	20962.9	8385.1	-	12577.8	475.9	12101.9	95	11496.8	35.158	96.3	335.1
Bulrush millet (sown alone)	313.1											
Big millet (sown with pulses)	356.9	2927.4	149.0	-	2778.4	58.9	2719.5	95	2583.5	7.901	21.6	74.1
Big millet (sown alone)	2570.5											
Maize	10044.8	10044.8	4017.9	-	6026.9	217.2	5809.7	89	5170.6	15.812	43.3	154.1
Rice (transplanted)	1260.4	1260.4	-	-	1260.4	25.0	1235.4	66 2/3	823.6	2.519	6.9	24.7
Rice (broadcast)	945.9	945.9	-	-	945.9	30.0	915.9	66 2/3	610.6	1.867	5.1	18.2
Pulses (sown with millets)	12386.3	12386.3	1978.0	-	10408.3	112.0	10296.3	95	9781.5	29.913	81.9	280.8
Sugar (gur)	6341.8	6341.8	1902.0	-	4439.8	519.1	3920.7	—	3920.7	11.989	32.8	115.1
Wheat	38640.6	38640.6	19320.3	-	19320.3	1526.0	17794.3	90	16014.9	48.975	134.2	448.2
Wheat-barley	14652.5	14652.5	4884.1	-	9768.4	366.0	9402.4	80	7521.9	23.003	63.0	209.7
Barley-peas	7380.0	7380.0	-	-	7380.0	369.0	7011.0	82	5749.0	17.581	48.2	163.4
Wheat-gram	1947.0	1947.0	-	—	1947.0	98.0	1849.0	92	1701.1	5.202	14.3	49.5
Peas-gram	647.5	647.5	-	-	647.5	60.0	587.5	95	558.1	1.707	4.7	16.5
Wheat-peas	1640.0	1640.0	-	-	1640.0	102.5	1537.5	92	1414.5	4.326	11.8	40.2
Barley-gram-peas	299.7	299.7	-	-	299.7	12.0	287.7	86 2/3	191.8	0.587	1.6	5.5
Barley	200.7	200.7	-	-	200.7	9.0	191.7	70	134.2	0.410	1.1	3.6
Wheat-barley-peas	1601.9	1601.9	-	-	1601.9	80.0	1521.9	85	1293.6	3.956	10.8	36.5
Total												1975.2

crops of wheat and barley. The total caloric consumption in the village, on the average, is 1,975. It is remarkable that all of the above foodstuffs have only a moderate amount of proteins and vitamin A. The crops each of which provides more than hundred calories per head per day, are deficient in fat, Maize, one of them has very small quantity of proteins— deficient in amino acid lysin. Sugar[1] is deficient in fats, proteins and the vitamins A,B,C,D. Hence their deficiency-diseases are also prevalent in the village.

POTENTIAL PRODUCTION UNIT

In the light of yield of crops in the village, an attempt has been made to ascertain the potential productivity of different types of lands in the village. Table LXXIX gives the relative productivity ratings and the total number of P.P.U. of each type of land in the village Bichoula.

Table LXXIX

Average Yield per acre of Normal Standard Farmland in the Village: 419 kilograms or 1 P.P.U.

Types of land	Area in acres	Average yield in kilograms per acre	Productivity rating per acre	Number of P.P.U.
Good quality land (A)	73.094	696	1.66	121.336
Medium quality land (B)	253.299	419	1.00	253.299
Poor quality land (C)	7.395	0	0	0
Total ...	333.788			374.635

1. Sugar is consumed in three forms: (1) boiled or unboiled juice of sugarcane, called '<u>auti</u>' and '<u>ras</u>' respectively, (2) lumps of unrefined sugar called '<u>gur</u>' or molasses called '<u>raab</u>' and (3) brown powder sugar called '<u>shakkar</u>.'

The Table shows that there is largest proportion of medium quality land in area, while the poor quality land is the least. The Potential Production Units in the village lands are considerably high with regard to its total area under cultivation. The good quality land which has smaller area than the medium quality lands, is equal to 1.66 P.P.U. per acre which results in its increasing contribution to the total number of P.P.U.

The medium quality land is equal to 1 P.P.U. per acre. A considerable area of the village lacks good facilities of irrigation. If the facilities of irrigation and manuring are increased in the medium quality lands, their productivity rating per acre may well be raised to a considerable extent. The productivity rating of even good quality lands may be increased more, provided more facilities are extended for irrigation and manuring— particularly compost and green manuring.

ND UTILIZATION IN SHAMSPUR

LOCATION

The village Shamspur lies in the Tilhar Tahsil and is situated at 79°39'6"E.long. and 27°54'32"N. lat. The land of the village is a part of alluvial plain. The general slope being gentle is from northeast to southwest. The texture of the soil is predominantly sandy loam. The villages on the boundary of village Shamspur are Karaunda in the north, Jaunra, in the northwest, Dhakha in the northeast, Kakrauwa in the south, Harnarayanpur in the west, and Kishorpur in the southeast (Fig.98).

The village is situated about eight kilometres southwest of Tilhar. A canal ~~is passing~~ passes through the village in its southern quarter. There is no road in the village and the only source of communication and transportation is the cart-track.

CLIMATE

There is no climatic data recorded for the village. However, the data of rainfall, recorded at the Tahsil headquarters of Tilhar Tahsil, may be regarded approximately the same as for the village rainfall conditions. Tables XLVIII and XLIX give the rainfall data.

Table XLVIII shows that the sowing period of the kharif crops —— June-July —— received scanty rainfall, whereas the months of August and September—— the period of growth of these crops —— received quite sufficient rainfall, being more than monthly averages. And October, having an average of 40.8 millimetres, was rainless. But during the season as a whole, the rainfall was insufficient, being 210 millimetres less than the average. It was suitable for the largest acreage under crops of millets, pulses and maize, as against the crop of rice which occupied a small area.

LOCATION OF THE VILLAGE SHAMSPUR

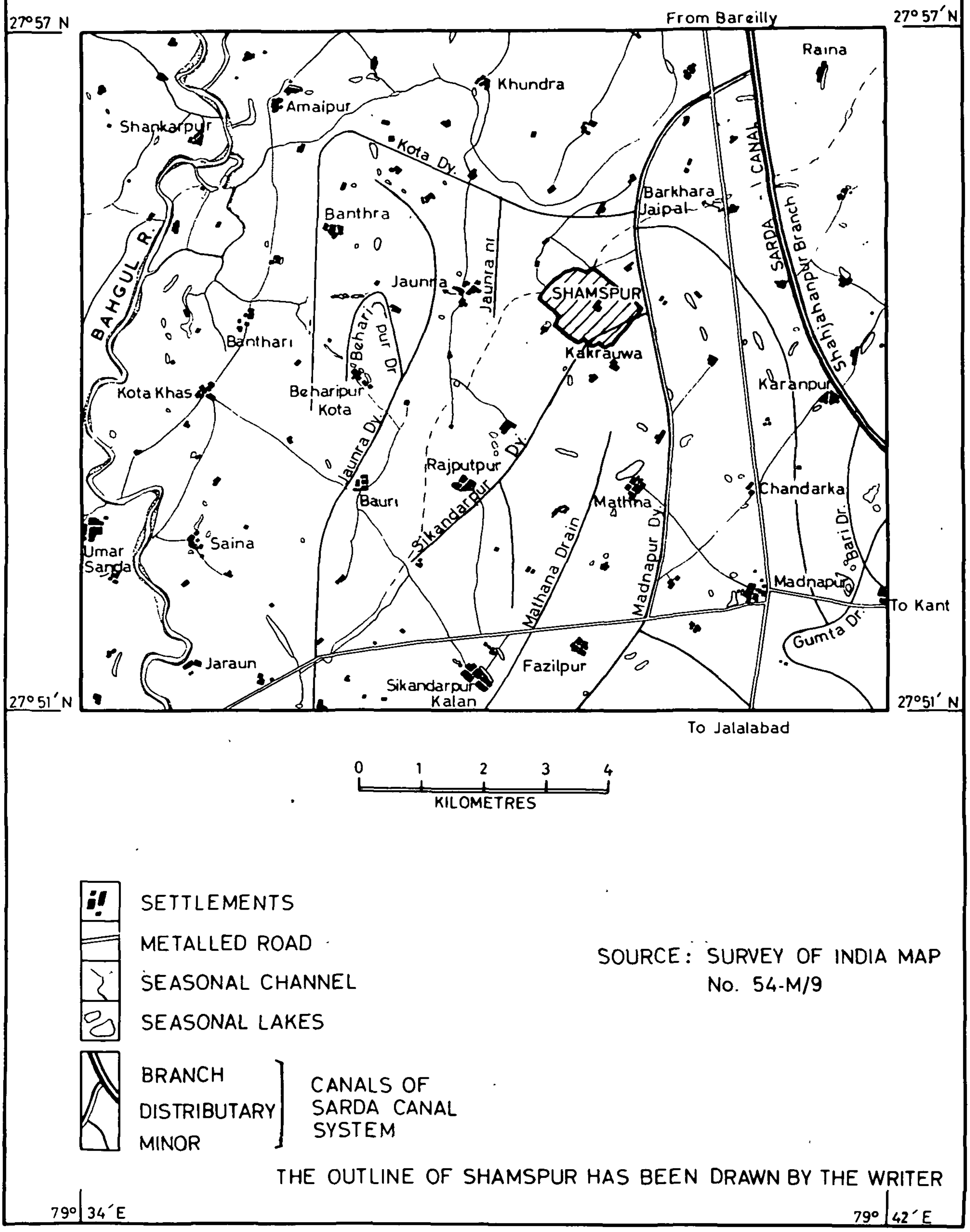

FIG.98

It will be seen from Table XLIX that the period of November—December, the sowing period of rabi crops, was rainless; while January received good rainfall as compared to the month's average. February and March received less rainfall than the average. The good rainfall in January was very much useful for all crops of the rabi season. The canal also supplements the water supply in January and February where necessary.

LAND CLASSIFICATION

The area available for cultivation in the village has been classified into the good quality (A) lands and the medium quality (B) lands (Fig.99).

The good quality (A) lands have an area of 46.23 acres or 34.4 per cent of the total area under cultivation. The good quality lands include the double cropped land and the area under sugarcane crop. The soil around the settlement is superior in fertility[1] due to regular application of human faeces[2] to the land in all seasons.

The rest of the cultivated area comprises the medium quality (B) lands which occupy 65.6 per cent of the total cultivated land; they consist of the sandy loam soil. All the medium quality lands are cropped in only one season, either kharif or rabi, and are left fallow in the other season for recuperation of fertility. The fallowing may be occasionally extended to two continuous seasons. The crops of millets, alone or mixed with pulses (pigeon pea), maize, peas, barley, bejhar, gojhi[3] or lentil are generally grown on medium quality lands. The production of rice is limited due to sandy texture of the soil.

There are no lands of poor (C) quality in the village.

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1. which is known as kachhiana or goind locally.
2. It is locally known as 'chirkin' for it serves as good manure.
3. The 'bejhar' is the mixed crop of barley, gram and peas, and 'gojhi' is the mixed crop of wheat and barley.

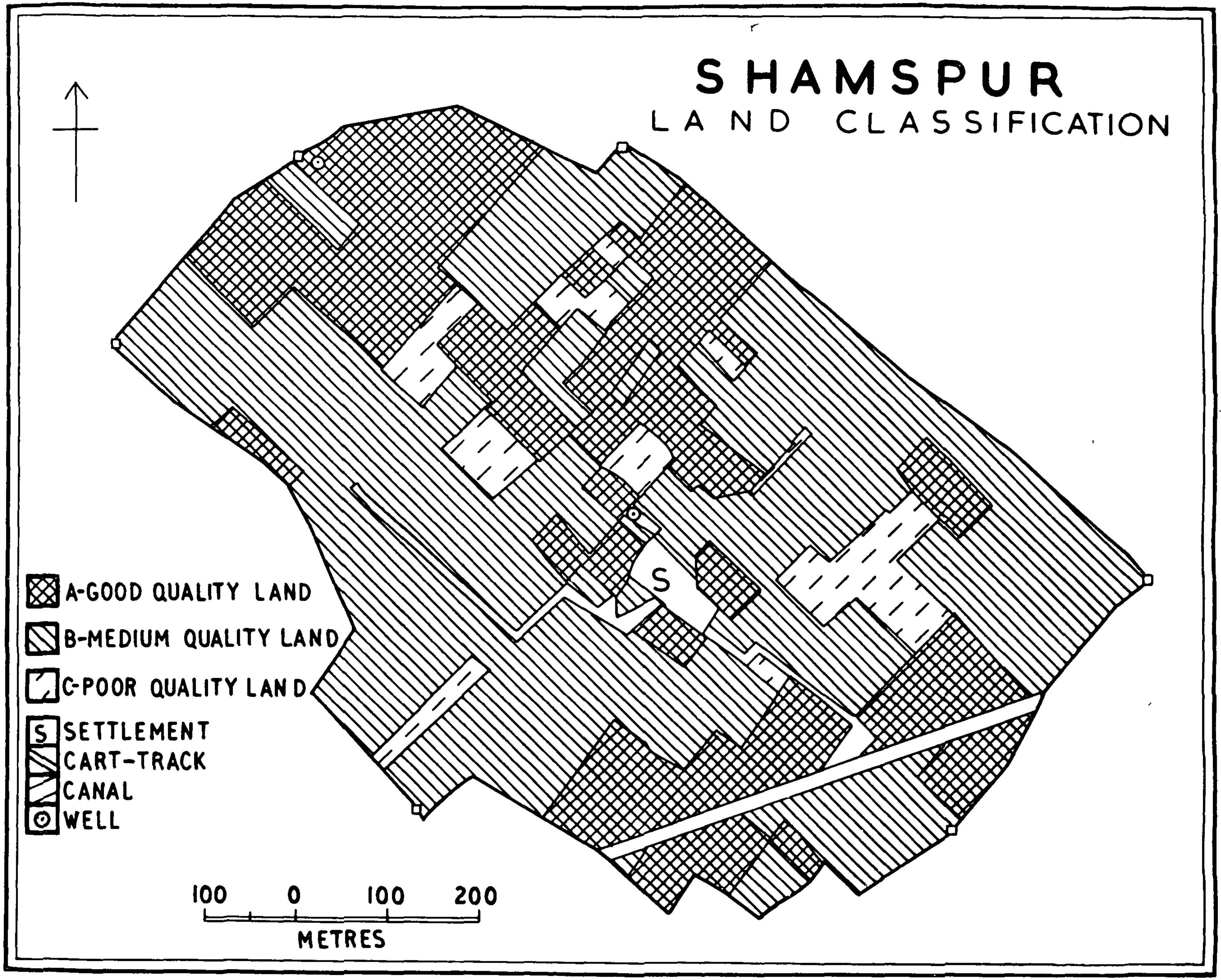
SHAMSPUR
LAND CLASSIFICATION
S
A-GOOD QUALITY LAND
B-MEDIUM QUALITY LAND
C-POOR QUALITY LAND
S SETTLEMENT
CART-TRACK
CANAL
WELL
100 0 100 200
METRES

FIG.99

IRRIGATION

The irrigated and unirrigated portions of the cultivated lands have been depicted in Fig.100. The irrigated area of the kharif season is smaller than that of the rabi season. Only sugarcane crop is irrigated in the kharif, whereas nearly all important crops of rabi need irrigation due to shortage of rainfall. The chief crops irrigated in the rabi season are wheat, gram and peas.

The canal irrigation is done through the 'lift method.' The '<u>boke</u>' is used in irrigating from canal or a pond while the '<u>rahat</u>' and '<u>charas</u>' are used in irrigating from masonry and non-masonry wells respectively. With one '<u>boke</u>', generally an area of 1.65 acres can be irrigated in one day from canal; while 0.75 acre can be irrigated from a well or pond in one day. The cost of irrigation from canal per acre is rupees 6.80 paise, while from each of the rest sources it is rupees 9.50 paise. Some of the masonry wells in the village are fitted with Persian wheels. The '<u>dhekli</u>' is fitted upon a non-masonry well. It irrigates generally the fields under vegetables. A pair of bullocks or a camel is used by the cultivators to drive a '<u>rahat</u>' around.[1]

LAND UTILIZATION

The lands under different agricultural and non-agricultural uses in the year 1962-63 are shown in Fig. 101. Table LXXX gives the areas of various uses of land in the village and their individual percentages to the total area of the village.

---

1. The use of camel has two advantages: a camel generally eats trees' green leaves, often of '<u>neem</u>' and thus straw and fodder are saved for cattle; the other advantage is that it has no need of a driver behind it when it moves around driving a '<u>rahat</u>', as its eyes are covered with cloth and it is left free to drive the '<u>rahat</u>' for many hours continuously.

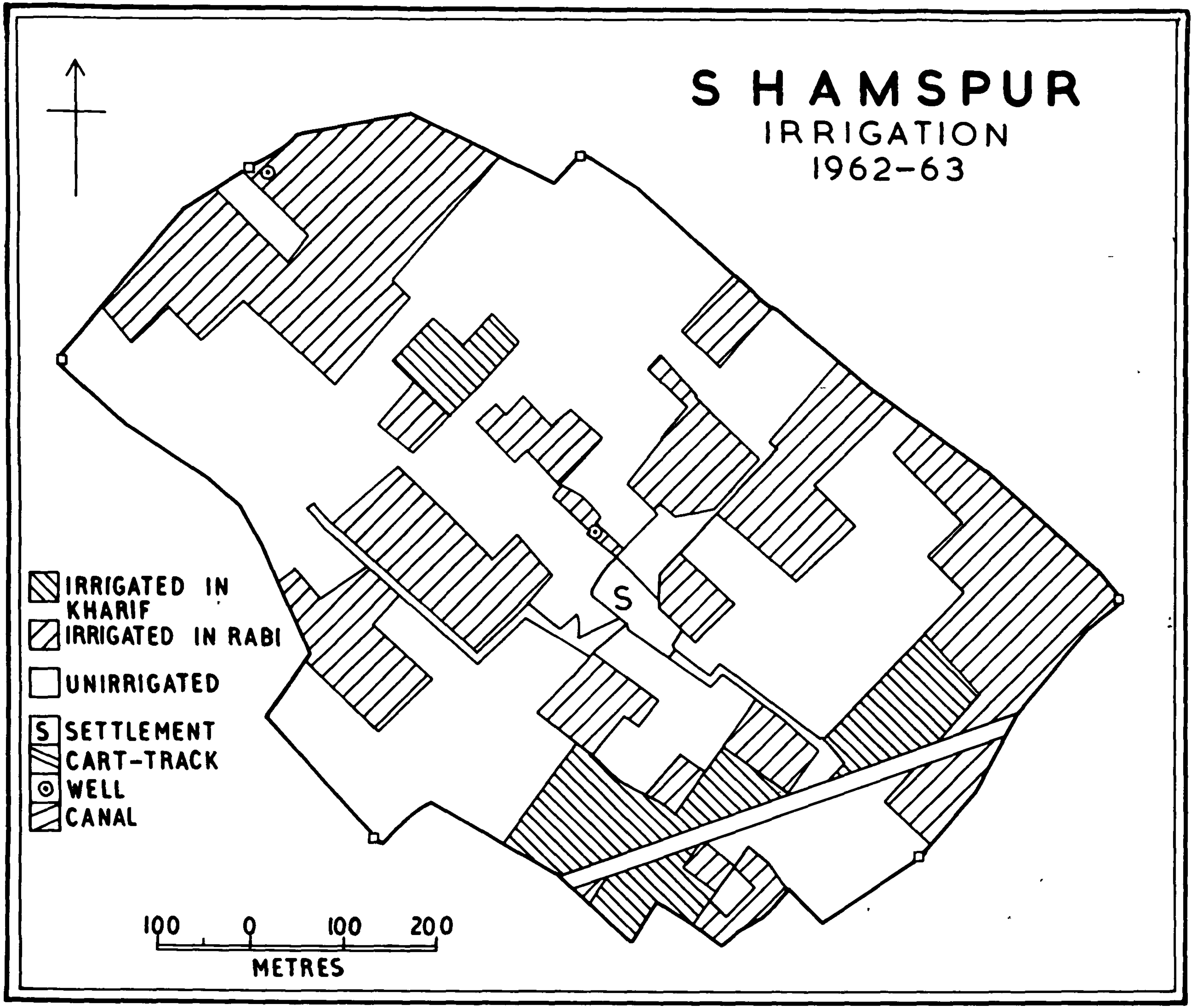
S HAMSPUR
IRRIGATION
1962-63
S
IRRIGATED IN KHARIF
IRRIGATED IN RABI
UNIRRIGATED
S SETTLEMENT
CART-TRACK
WELL
CANAL
100 0 100 200
METRES

FIG. 100

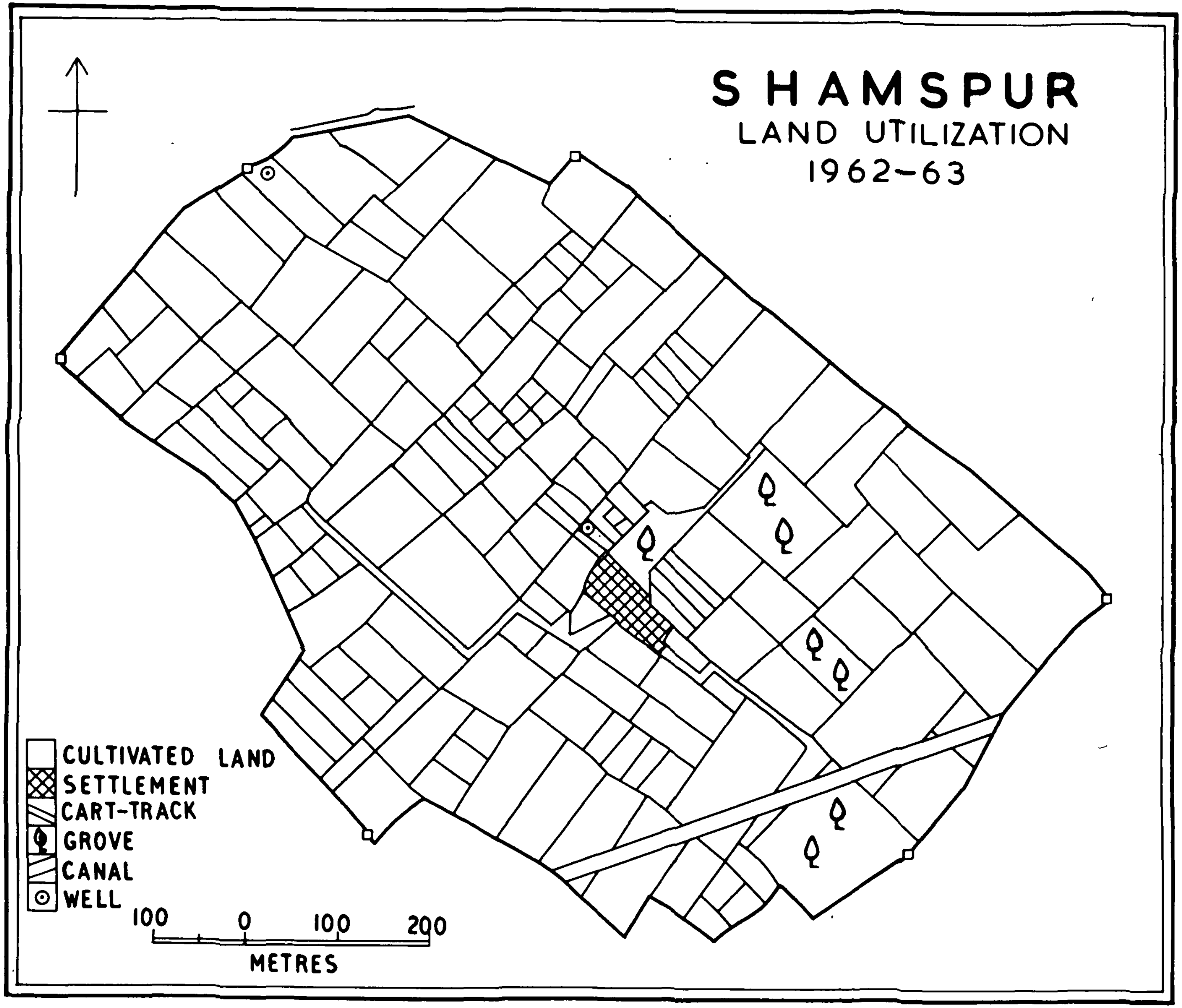
SHAMSPUR
LAND UTILIZATION
1962-63
CULTIVATED LAND
SETTLEMENT
CART-TRACK
GROVE
CANAL
WELL
100
0
100
200
METRES

FIG.101

Table LXXX

Total area of the Village ... 145.47 acres

Use of land	Area in acres	Percentage to the total area
Cultivated land	134.38	92.38
Grove	6.52	4.48
Cart-track	1.85	1.27
Settlement	1.10	0.76
Area occupied by canal	1.62	1.11
Total ...	145.47	100.00

The above Table shows that 92.38 per cent of the village area is under plough. The area under groves[1] is 4.48 per cent; while 3.14 per cent of the area includes all other uses of land as cart-track, settlement and area under the canal. The shape of the fields is generally rectangular. The fields around the settlement are most intensively cultivated and are generally smaller in size than other fields. A big field may be temporily sub-divided into two or more parts during a season or two for different crops.

LAND UTILIZATION IN THE KHARIF SEASON

The cultivated area under various crops and other uses of land in the kharif season, 1962, are shown in Fig.102. A summary of the area occupied by each crop and its percentages to the total cultivated land and to the net cropped land in the kharif season are given in Table LXXXI.

1. Due to absence of woodland in the village, thousands of dung-cakes — prepared, dried and piled up in huge heaps called 'bitaura' — are seen around the settlement which are used in fuel purposes throughout the year.

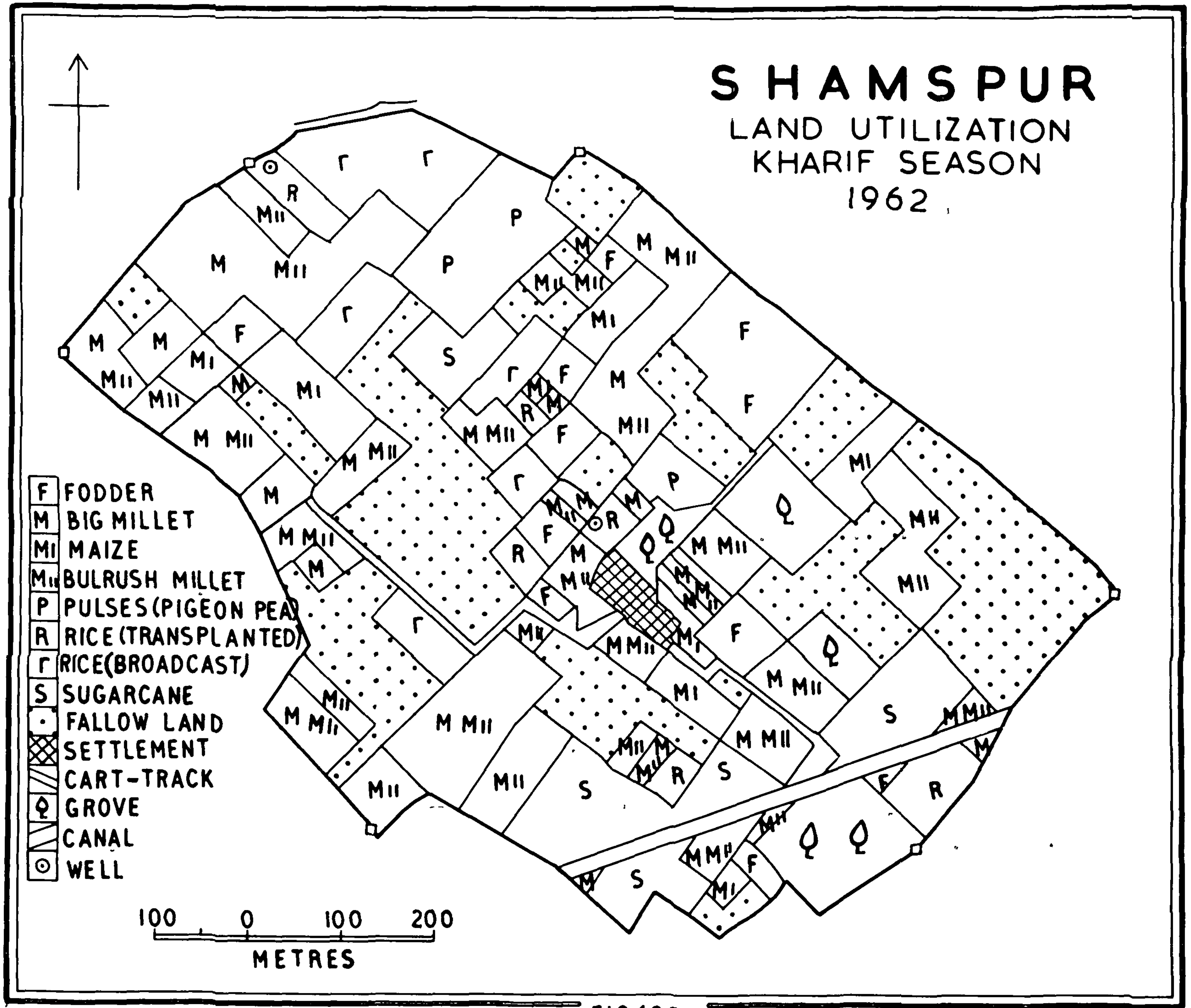
SHAMSPUR
LAND UTILIZATION
KHARIF SEASON
1962
F FODDER
M BIG MILLET
MI MAIZE
MII BULRUSH MILLET
P PULSES (PIGEON PEA)
R RICE (TRANSPLANTED)
r RICE (BROADCAST)
S SUGARCANE
FALLOW LAND
SETTLEMENT
CART-TRACK
GROVE
CANAL
WELL
100 0 100 200
METRES

FIG.102

Table LXXXI

Total Cultivated Land ... 134.38 acres

Net Cropped Land in the Kharif Season ... 91.85 acres

Crops	Area in acres	Percentage to the total cultivated land	Percentage to the net cropped land	Total percentage to the total cultivated land	Total percentage to the net cropped land
Grain Crops				51.38	75.16
Big millet and bulrush millet	29.34	21.83	31.94		
Bulrush millet	11.94	8.89	13.00		
Rice (broadcast)	9.21	6.86	10.03		
Rice (transplanted)	4.37	3.25	4.76		
Maize	6.51	4.85	7.09		
Pulses	4.84	3.60	5.27		
Big millet	2.82	2.10	3.07		
Other Crops				16.97	24.84
Sugarcane	11.79	8.77	12.84		
Fodder	11.03	8.20	12.00		
Fallow	42.53	31.65		31.65	
Total ...	134.38	100.00	100.00	100.00	100.00

Table LXXXI shows that 51.38 per cent of the total land available for cultivation in the village is under grain crops and 16.97 per cent under other crops. A large proportion of the cultiated land, being 31.65 per cent, is under fallowing. Of the total net cropped land, about 75 per cent is under grain crops, leaving about 25 per cent under other crops.

It will be seen from the above table that the largest grain crop, 44.94 per cent of the net cropped land, is of big millet and bulrush millet (mixed) and bulrush millet. Crops of millets and pulses occupy the largest area, 53.28 per cent of the net cropped land in the season. The crops of rice which require greater water for growth occupy only 14.79 per cent of the net cropped land, while other grain crops are best suited to less availability of water and the sandy loam texture of the soil. The millets and pulses are cropped alone in the village which point out weakness of land in fertility.

The other crops of the season are sugarcane and fodder which occupy an area of 12.84 and 12.0 per cent respectively.

The large fallowing, 31.65 per cent, indicates the weakness of the soil which is left for recuperation of fertility. The area which is put to fallow for one or more seasons amounts to be the large among the cultivated lands.

LAND UTILIZATION IN THE RABI SEASON

The distribution of various crops grown in the rabi season, 1962-63, and other uses of land have been depicted in Fig.103. Table LXXXII gives a summary of the area under each crop and its percentages to the total cultivated land and to the net cropped land in the season.

It will be seen from Table that only 48.55 per cent of the total land available for cultivation in the village has been cropped in the rabi season, and the whole area cultivated in the rabi season is under grain crops. During the rabi season, the continual kharif crops (pulses and sugarcane) occupy 12.37 per cent of the total cultivated land. Moreover, a large part of the cultivated land, 39.07 per cent, remains under fallowing during the season, which is the medium quality land.

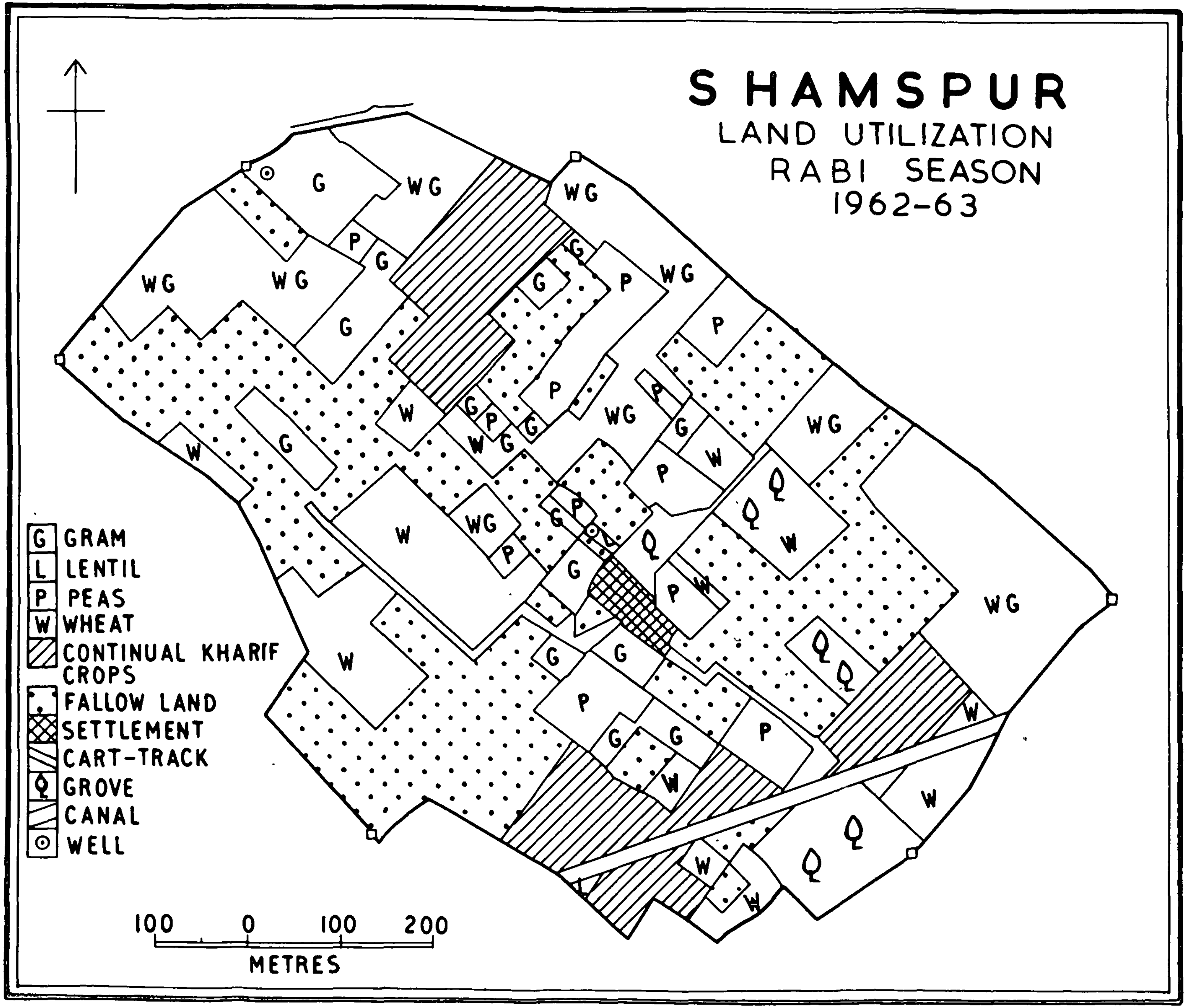
SHAMSPUR
LAND UTILIZATION
RABI SEASON
1962-63
G GRAM
L LENTIL
P PEAS
W WHEAT
CONTINUAL KHARIF CROPS
FALLOW LAND
SETTLEMENT
CART-TRACK
GROVE
CANAL
WELL
100 0 100 200
METRES

FIG.103

Table LXXXII

Total Cultivated Land ... 134.38 acres

Net Cropped Land in the Rabi Season ... 65.25 acres

Crops	Area in acres	Percentage to the total cultivated land	Percentage to the net cropped land	Total percentage to the total cultivated land	Total percentage to the net cropped land
Grain Crops				48.55	100.00
Wheat-gram	28.34	21.09	43.43		
Wheat	16.53	12.30	25.34		
Gram	10.29	7.66	15.77		
Peas	9.99	7.43	15.31		
Lentil	0.10	0.07	0.15		
Fallow	52.50	39.07		39.07	
Continual kharif crops	16.63	12.38		12.38	
Total ...	134.38	100.00	100.00	100.00	100.00

The crop of wheat-gram mixed is the biggest of the season,being 43.43 per cent of the net sown area. The crop of wheat, occupying about a quarter of the net cropped area, is the second largest crop of the season. The crops of gram and peas occupy considerable proportion of the net sown area, 15.77 and 15.31 per cent respectively. The lentil has the least area.

The other crops are not sown in the rabi season. The needs of fodder are fulfilled by the straw of wheat, gram and peas. During the growing period, the green plants of peas, with or without legumes, are also used as fodder.

The crops of wheat— gram mixed, peas and lentil are generally grown in the soil usually known weaker than that under the crop of wheat exclusively. The land which can hardly be irrigated is cropped with lentil.

DOUBLE CROPPED LAND

The cultivated land which is cropped in the *kharif* as well as in the *rabi* season is shown in Fig.104. The double cropped land in the village is 34.44 acres or 25.6 per cent of the total land available for cultivation in the village.

All the land under double cropping possesses good quality (A) land. However, the area under double cropping may increase or decrease from year to year in accordance with increase or decrease of application of manure and irrigation to the land under cultivation. The double cropped land per capita is 0.292 acre.

ROTATION OF CROPS

Certain rotations of crops are adopted in the village, they are nearly the same as in previous villages, Junawai and Bichoula. The good quality (A) lands are usefully cropped in successive seasons for years. The need and will of the farmer do also play an important role in rotation of crops.

LAND USE AND POPULATION

The total population of the village is 118. The total areas and the per capita share in the cultivated land, net cropped land in the kharif as well as in the rabi season, gross cultivated land and the double cropped land are given in Table LXXXIII.

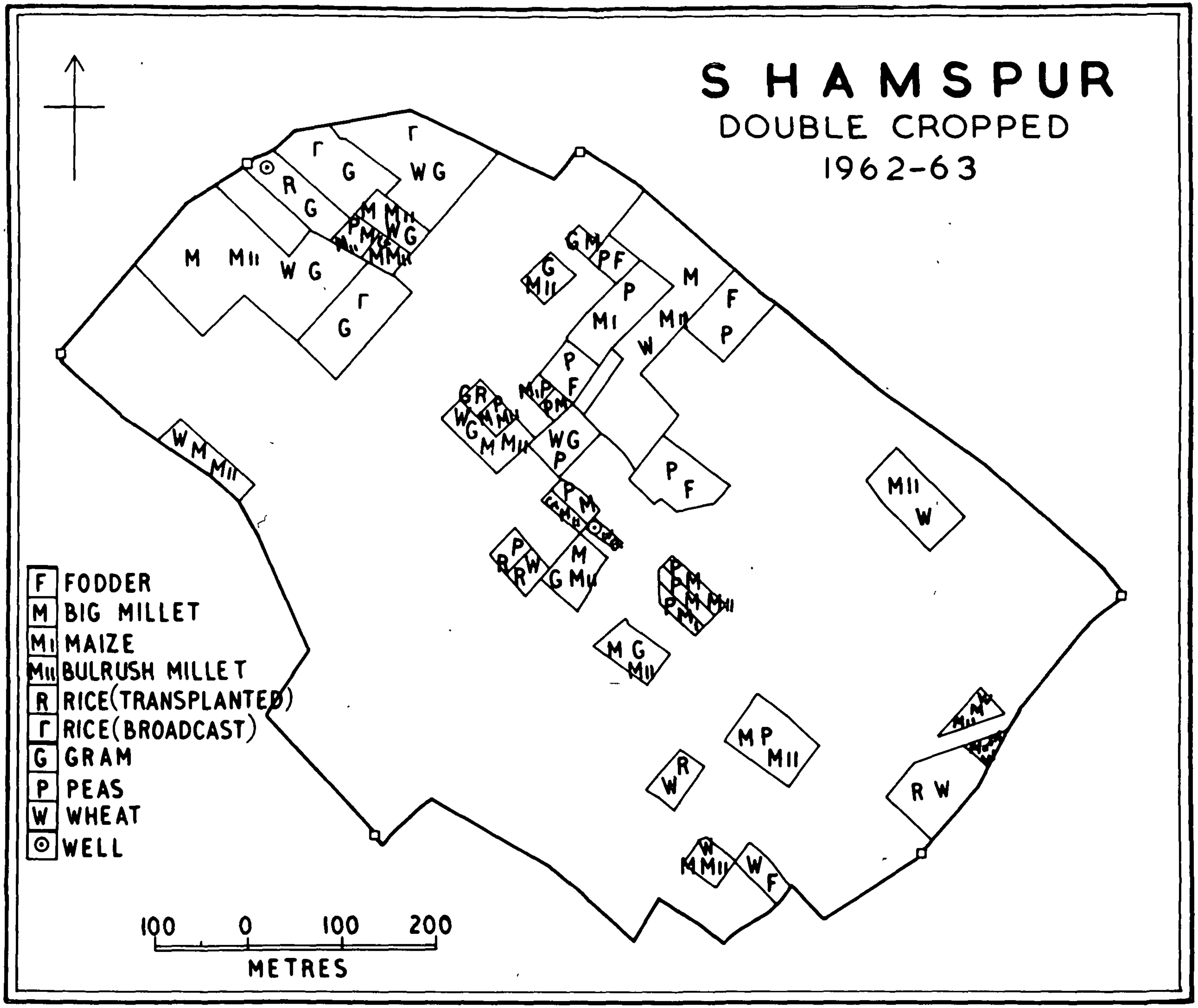
SHAMSPUR
DOUBLE CROPPED
1962-63
F FODDER
M BIG MILLET
MI MAIZE
MII BULRUSH MILLET
R RICE(TRANSPLANTED)
Γ RICE(BROADCAST)
G GRAM
P PEAS
W WHEAT
⊙ WELL
100 0 100 200
METRES

FIG.104

Table LXXXIII

Total Population of the Village Shamspur .. 118
(Area in acres)

	Total area of the village	Total land available for cultivation 1	Net cropped land in the kharif season	Net cropped land in the rabi season	Gross culti-vated land (both of kharif and rabi)	Double cropped land
	145.47	134.38	91.85	65.25	157.10	34.44
Land per head of population	1.233	1.139	0.778	0.553	1.331	0.292

The Table shows that the per capita land available for cultivation is 1.139 acres and owing to large fallowing in the kharif season, it is reduced to 0.778 acre. It further decreases to 0.553 acre in rabi due to both fallowing and occupation of land by the continual kharif crops during the rabi season.

The gross cultivated area per head of population amounts to 1.331 acre The actual amount of land which supported one person, on an average, is thus 1.331 acres in the village. The land which produces two different crops during the year amounts to be only 0.292 acre per head of population.

Out of the total population, 95 per cent are primary rural or the cultivators while the rest are secondary rural including potter and carpenter who depend upon the produce of the cultivating class through their ancillary services.

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1. It includes 11.72 acres of agricultural land being under annual fallowing.

CALORIC INTAKE

The yields of different crops grown in the kharif and the rabi seasons in the village are given in Table LXXXIV A. On the basis of the yield-rates, the total production of various crops in the village has been computed by the writer and the total caloric consumption per head per day has been inferred in Table LXXXIV B.

Table LXXXIV A

Crops	Yield per acre (in kilograms)
Big millet	149
Bulrush millet	140
Rice (broadcast) unhusked	345
Rice (transplanted) unhusked	382
Maize	265
Pulses (pigeon pea)	121
Cane sugar (gur)	933
Wheat	340
Gram	252
Peas	411
Lentil	149

Most of the crops having low yield rates are produced in the medium (B) quality lands which occupy 65.6 per cent of the total land available for cultivation in the village.

Table LXXXIV B shows the total yield of each crop produced in the village. After deducting the amounts of exported foodstuffs and seeds preserved

Table LXXXIV

FOOD BALANCE SHEET

VILLAGE SHAMSPUR

(in kilograms)

Population ... 118 Year 1962-63

Commodity	Total Production	Export	Import	Availavle Supply	Seed	Feed (Gross)	Extraction rate per cent	Feed (net)	Per head Consumption Kilograms per year	Grams per day	Calories per day
Big millet and Bulrush millet	8758.6	5955.8	-	2802.8	164.3	2638.5	95	2506.6	21.242	58.2	201.1
Bulrush millet	3570.1	1963.6	-	1606.5	66.9	1539.6	95	1462.6	12.395	33.9	117.9
Rice (broadcast)	3177.5	-	-	3177.5	257.8	2919.7	66 2/3	1946.5	16.495	45.2	161.4
Rice (transplanted)	1669.3	-	-	1669.3	40.8	1628.5	66 2/3	1085.7	9.201	25.2	90.5
Maize	2187.4	459.4	-	1728.0	54.7	1673.3	89	1489.2	12.620	34.6	123.2
Pulses	813.1	227.7	-	585.4	16.0	569.4	95	530.9	4.499	12.3	42.2
Big millet	843.2	421.6	-	421.6	15.8	405.8	95	385.5	3.267	8.9	30.5
Sugar (gur)	11000.1	6600.0	-	4400.1	990.1	3410.0		3410.0	28.898	79.2	277.9
Gram	2490.2	-	-	2490.2	473.3	2016.9	95	1916.1	16.238	44.5	159.3
Peas	4105.9	1368.6	-	2737.3	459.5	2277.8	95	2163.9	18.338	50.2	173.7
Lentil	14.9	-	-	14.9	0.6	14.3	95	13.6	0.115	0.3	1.0
Wheat	6463.2	646.3	-	5816.9	710.8	5106.1	90	4595.5	38.945	106.7	356.4
Wheat-gram	8955.4	3359.0	-	5596.4	1246.9	4349.5	92	4001.5	33.911	92.9	321.4
Total											2056.5

the total available supply of them has been computed and extraction rates have been applied. The total food available from each crop and the per head per day consumption are calculated. The total calories, inferred from the above, amount to be 2,057 per head per day in the village.

The large caloric intakes from crops are in order from wheat, wheat-gram mixed, canesugar (gur), big millet-bulrush millet mixed, peas, rice (broadcast), gram, maize and bulrush millet. The other crops like rice (transplanted), pulses and big millet provide smaller amounts of calories to the average daily diet.

POTENTIAL PRODUCTION UNIT

An evaluation of different types of agricultural lands in the village has been done by the writer to assess their potential productivity on the basis of varying yields of crops. Table LXXXV gives the relative ratings of different types of cultivated lands and total numbers of Potential Production Units have been calculated for each of them.

Table LXXXV

Average Yield per acre of Normal Standard Farmland in the Village: 260 — kilograms or 1 P.P.U.

Type of land	Area in acres	Average yield in kilograms per acre	Productivity rating per acre	Number of P.P.U.
A	46.23	488	1.88	86.91
B	88.15	260	1.00	88.15
Total ..	134.38			175.06

It will be seen from the Table that the total Potential Production Units are very high as compared to the total cultivated land of the village. The good quality (A) land, being a little more than half of the remaining cultivated land, is equal to 1.88 P.P.U. per acre which results in its large contribution to the total number of P.P.U. The medium quality land (B) possesses the normal standard productivity and is equal to i P.P.U. per acre, providing the P.P.U. equal to its area to the total P.P.U. of the village. The higher number of total P.P.U. in the village is also due to absence of BII or poor quality (C) lands.

If the facilities of irrigation are adequately extended and the manuring is sufficiently applied to the B quality lands, a considerable part of this type of land may well be converted into the good quality (A) land with respect to productivity rating per acre. It is because the inadequacy of manuring by compost or green manures and insufficient water supply may certainly degrade the good productivity of the cultivated lands.

CHAPTER IX

LAND UTILIZATION IN KALYANPUR

LOCATION

The village of Kalyanpur, lying in the Dataganj Tahsil, is situated at 79° 22' 56" E.long. and 28° 6' 21" N.lat. (Fig.105). The village lies in the low-land which has a gentle slope towards south. The texture of the soil is dominantly clayey loam. The village Kalyanpur is bounded by villages of Firozpur Bajha in the west, Jhuksa in the east, Bora in the north, Nathpur Banwari in the southwest and Dhonrera in the south.

The village is situated at a distance of about 10 kilometres northwest of Dataganj town and about 3.5 kilometres northwest of Bhatauli, a big village. Kalyanpur is about 1.5 kilometres southwest of the Ramganga river.

The pargana headquarters relating to the village are at Salempur, a village adjacent to the Dataganj town. There is no road in the village. A broad cart-track goes to Bora from Firozpur Bajha which passes through agricultural area of this village in the northwest. It may easily be developed into a road. Another cart-track comes to the settlement of this village from the former cart-track.

CLIMATE

No climatic data are recorded for the village. However, the data of rainfall recorded at the Tahsil headquarters of Dataganj may be

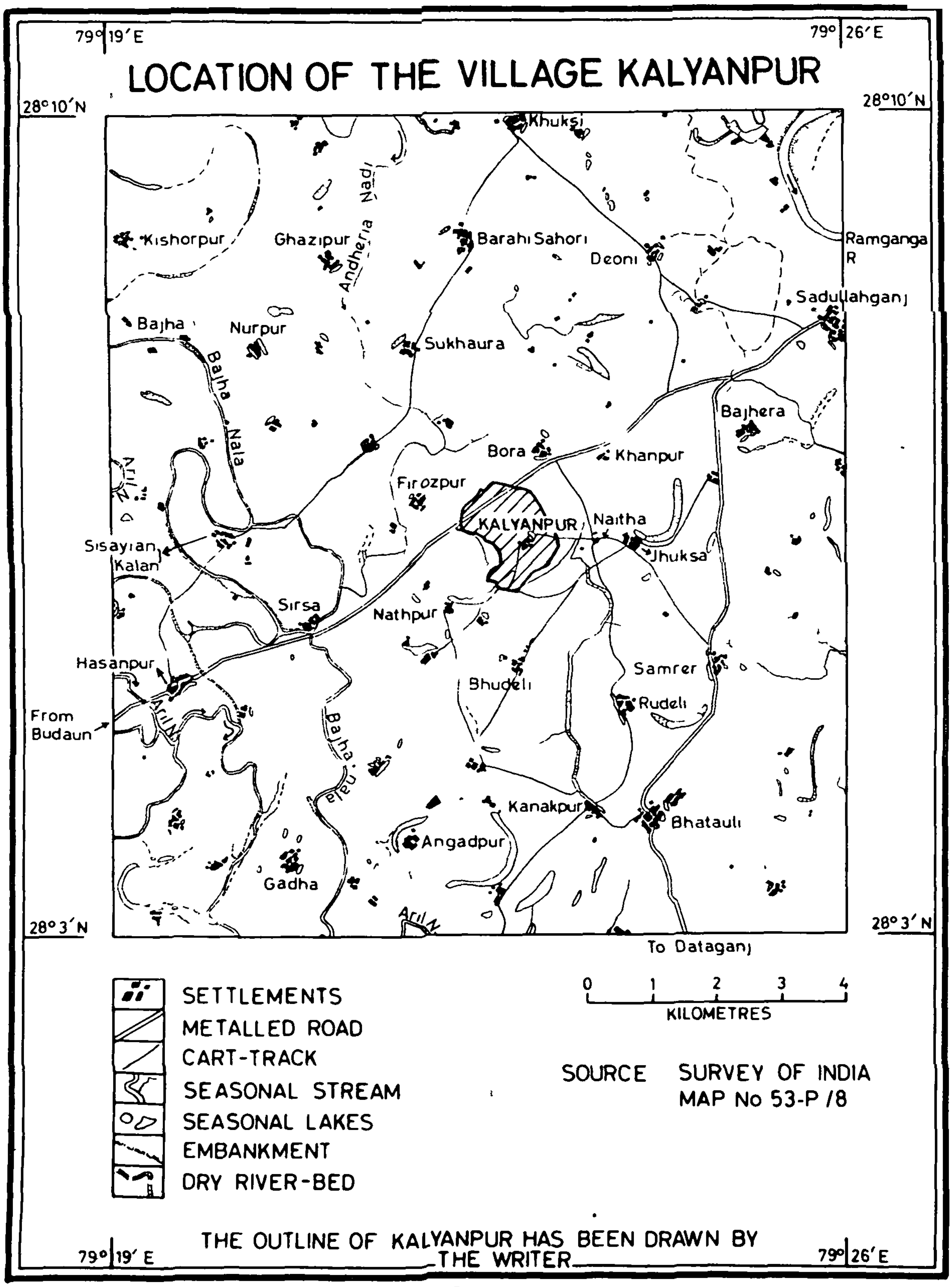
79° 19′E
79° 26′E
LOCATION OF THE VILLAGE KALYANPUR
28° 10′N
28° 10′N
Khuksi
Andheria Nadi
Kishorpur
Ghazipur
Barahi Sahori
Deoni
Ramganga R
Sadullahganj
Bajha
Nurpur
Sukhaura
Bajha Nala
Bajhera
Bora
Khanpur
Aril N.
Firozpur
KALYANPUR
Naitha
Sisayian Kalan
Jhuksa
Sirsa
Nathpur
Hasanpur
Samrer
Bhudeli
Rudeli
From Budaun
Aril N.
Bajha Nala
Kanakpur
Bhatauli
Angadpur
Gadha
Aril N.
28° 3′N
28° 3′N
To Dataganj
0 1 2 3 4
KILOMETRES
SETTLEMENTS
METALLED ROAD
CART-TRACK
SEASONAL STREAM
SEASONAL LAKES
EMBANKMENT
DRY RIVER-BED
SOURCE SURVEY OF INDIA
MAP No 53-P /8
THE OUTLINE OF KALYANPUR HAS BEEN DRAWN BY THE WRITER
79° 19′ E
79° 26′ E

FIG.105

taken for the approximate rainfall conditions of the village. Tables XXXII and XXXIII give the rainfall of the kharif and rabi seasons, recorded at Dataganj.

Table XXXII shows that the first two months of the kharif season, being the sowing period of the crops, received a deficient rainfall. But the next two months got a good rainfall, while in September it was 126 millimetres more than its average. The month of October was rainless.

The total rainfall of the season was 97 millimetres less than the average. Nevertheless, the crops were, more or less, satisfactory.

Further, Table XXXIII shows that the rabi season suffered from a failure of rainfall. The first two months and the last two months of the season were totally rainless, and it was only January which got only 12.7 millimetres of rainfall, being quite below the month's average. The season, which has an average rainfall of 60.8 millimetres, received only 12.7 millimetres of rainfall. But, owing to clayey loam texture, the soil had a capacity to retain moisture for tillage and manuring and sowing the rabi crops.

LAND CLASSIFICATION

The total area available for cultivation is classified into the good quality (A) lands, the medium quality (B) lands, and the poor quality (C) lands. The medium quality lands have been sub-divided into B_1 and B_{11} quality lands (Fig. 106).

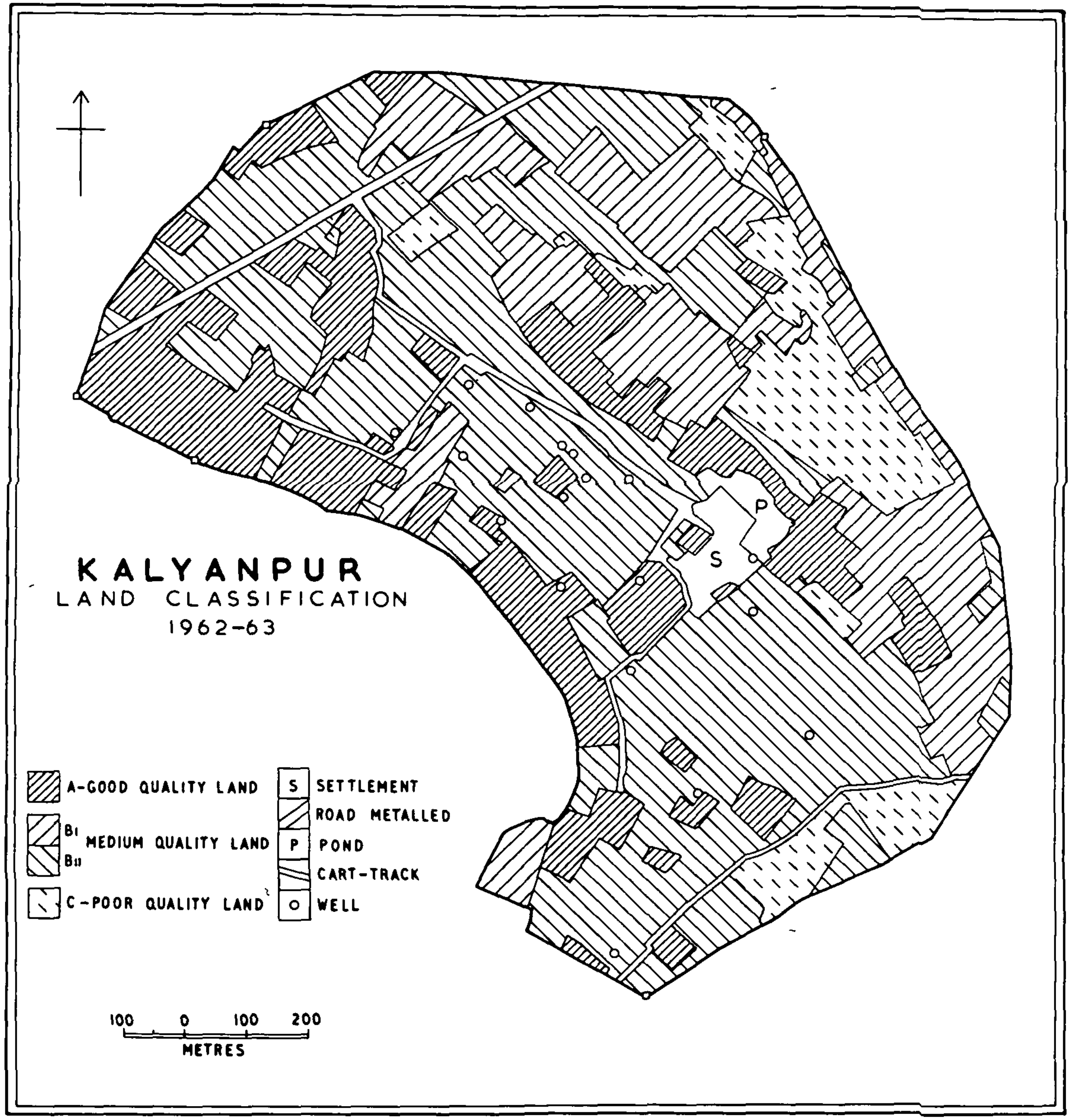
KALYANPUR
LAND CLASSIFICATION
1962-63
A-GOOD QUALITY LAND
B1
MEDIUM QUALITY LAND
B11
C-POOR QUALITY LAND
S SETTLEMENT
ROAD METALLED
P POND
CART-TRACK
WELL
100 0 100 200
METRES
P
S

FIG 106

The good quality (A) lands, having an area of 67.031 acres or 22.4 per cent of the total land under plough, include the double cropped area and the land under sugarcane. The most fertile land which lies around the settlement of the village is the best part of it as the regular application of human faeces increases the fertility of the soil.

The medium quality B_1 lands, having an area of 36.719 acres or 12.3 per cent of the total cultivated area, are exclusively suitable for cultivation of rice and gram. But the medium quality B_{11} lands are inferior in fertility to the B_1 lands. The B_{11} lands are generally devoted to crops of millets, pulses, maize, fodder, sweet potato, wheat, barley and peas.

Both the categories of medium quality lands are cropped in either the kharif or the rabi season. The area of B_{11} lands is 194.424 acres or 65.3 per cent of the total area available for cultivation.

The poor quality (C) lands have an area of 11.937 acres or 3.6 per cent of the total area of the village. The poor quality lands, being under the efflorescent <u>reh</u> soil, remain agriculturally unproductive.

<u>IRRIGATION</u>

The irrigated and unirrigated portions of the cultivated lands are shown in Fig. 107. The <u>Kharif</u> - irrigated area is smaller than that of <u>rabi</u>. Only Sugarcane is irrigated in the kharif season, while all crops of the <u>rabi</u> season require irrigation and many are irrigated

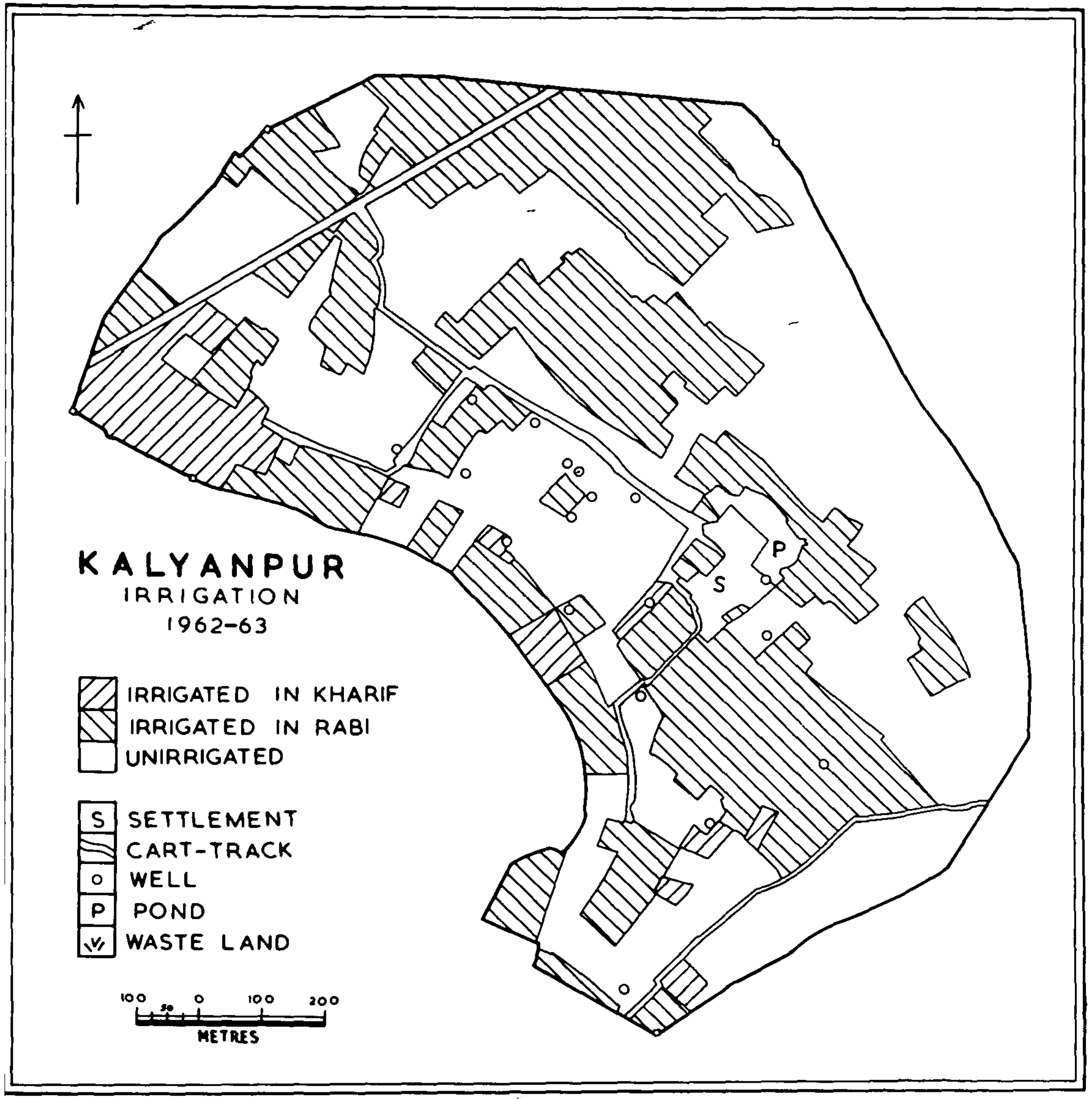
KALYANPUR
IRRIGATION
1962-63
IRRIGATED IN KHARIF
IRRIGATED IN RABI
UNIRRIGATED
S SETTLEMENT
CART-TRACK
WELL
P POND
WASTE LAND
100 50 0 100 200
METRES
S
P

FIG 107

when and where possible. The chief crops irrigated in the rabi are wheat, wheat-gram and peas-gram (mixed).

The sources of irrigation include ponds, wells (both masonry and non-masonry). The non-masonary wells have often '*charas*' and '*dhekli*' to irrigate fields while some of the mosonry wells are fitted with '*rahat*'.

An area of 0.8 acres, on an average, is irrigated from a masonry well in a day while 0.5 acre is irrigated from a pond or a non-masonry well. The cost of irrigation is rupees fourteen per acre from a masonry well and rupees ten from a non-masonry well or a pond. The small scale irrigation like that of the vegetable crops is usually done by '*dhekli*'. Bullocks are often used in driving a '*rahat*'.

LAND UTILIZATION

The agricultural fields and other lands are shown in Fig. 108. Table LXXXVI gives the areas of various uses of land in the village and their individual percentages to the total area of the village.

TABLE LXXXVI

Total area of the village 331.752 acres

Use of land	Area in acres	Percentage to the total area.
Cultivated land	298.174	89.88
Grove	8.344	2.51
Settlement	3.938	1.19
Cart-track	6.984	2.10
Pond	2.375	0.72
Waste land	11.937	3.60
Total	331.752	100.00

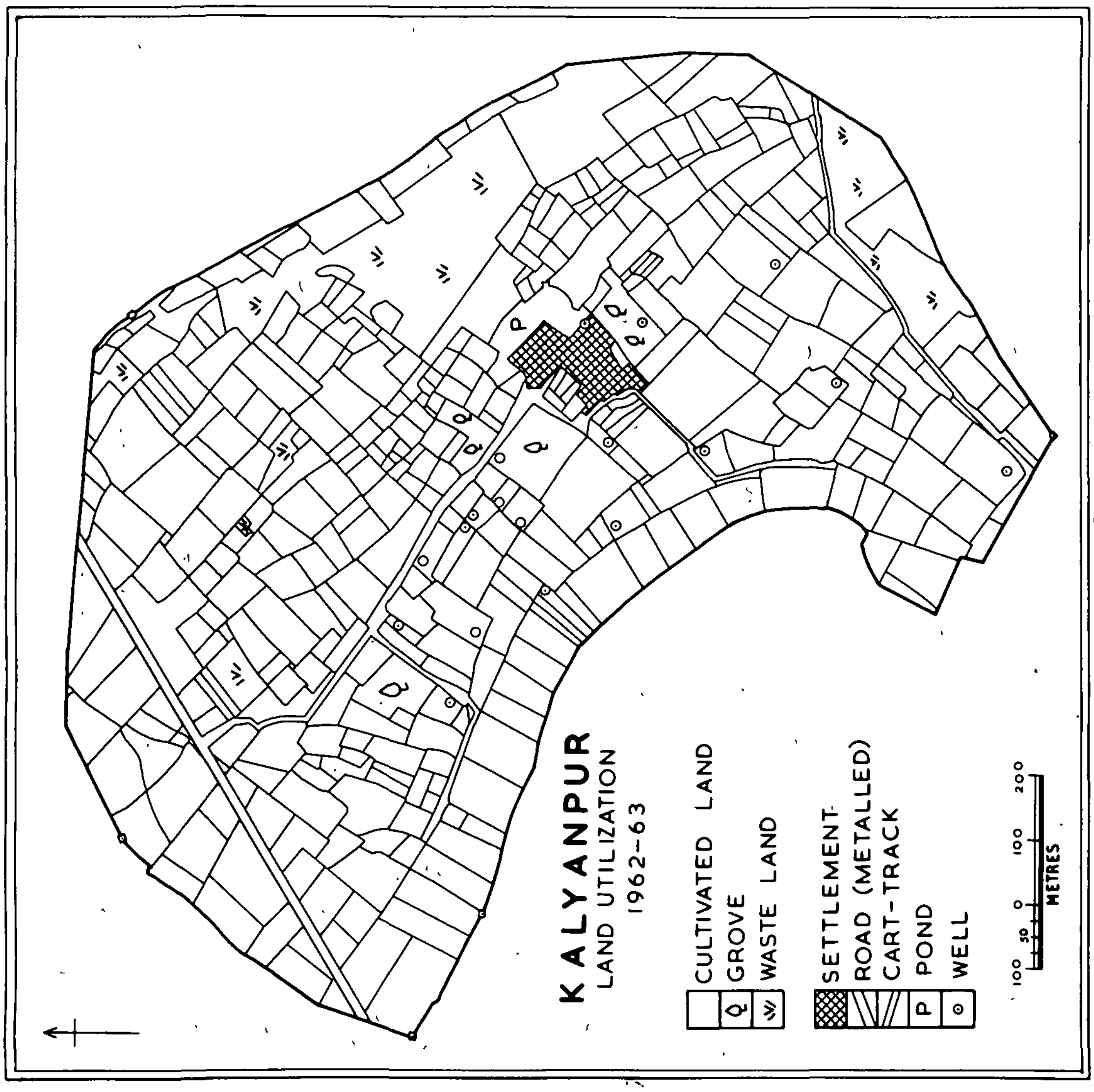
KALYANPUR
LAND UTILIZATION
1962-63
CULTIVATED LAND
GROVE
WASTE LAND
SETTLEMENT
ROAD (METALLED)
CART-TRACK
POND
WELL
P
100 50 0 100 200
METRES

FIG.108

The above Table indicates that 89.88 per cent of the total area of the village is under cultivation. The largest among the non-agricultural lands is the waste land being 3.6 per cent; areas under groves and cart-tracks are 2.51 and 2.1 per cent respectively. Ponds possess the least area in the village.

The shapes of the fields in general are rectangular and quadrilateral. The fields around the settlement and in the vicinity of the pond are generally smaller in size than other fields. The practice of villagers to prepare thousands of dung-cakes[1] is also prevalent in the village, of which numerous large heaps stand on the outskirts of the settlement.

A big field under cultivation is temporarily sub-divided for a season or two into two or more portions for different crops.

LAND UTILIZATION IN THE KHARIF SEASON

The cultivated land under various crops and other uses of land during the kharif season, 1962, are depicted in Fig. 109. Table LXXXVII gives a summary of the area occupied by each crop. The percentages of each crop to the total cultivated land and to the net cropped land in the kharif season are also given in the Table.

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1. The dung-cake is locally known as '*upla*'.

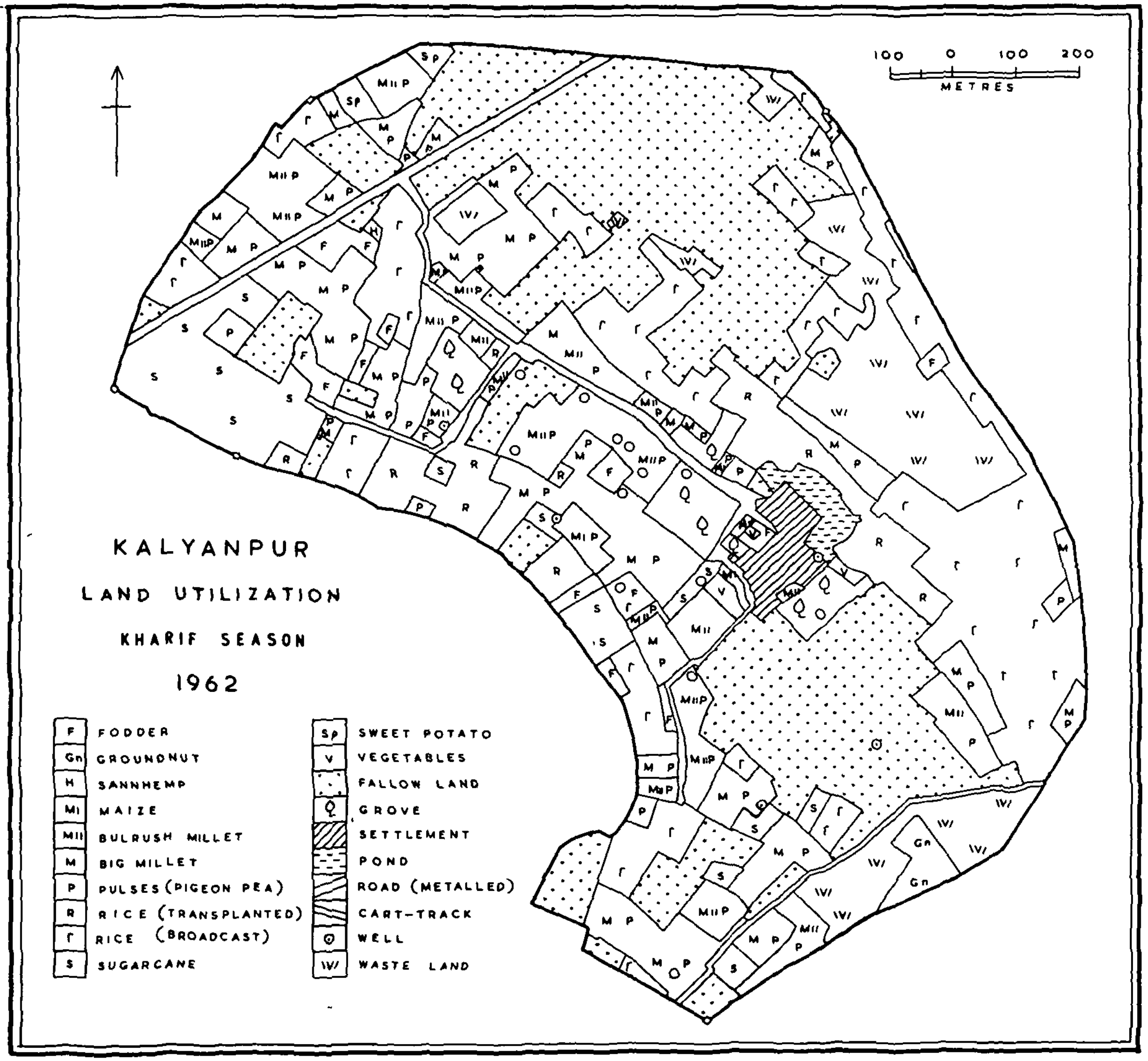
KALYANPUR
LAND UTILIZATION
KHARIF SEASON
1962
F FODDER
Gn GROUNDNUT
H SANNHEMP
Mi MAIZE
Mll BULRUSH MILLET
M BIG MILLET
P PULSES (PIGEON PEA)
R RICE (TRANSPLANTED)
r RICE (BROADCAST)
S SUGARCANE
Sp SWEET POTATO
V VEGETABLES
FALLOW LAND
GROVE
SETTLEMENT
POND
ROAD (METALLED)
CART-TRACK
WELL
W/ WASTE LAND
100 0 100 200
METRES

FIG.109

TABLE LXXXVII

Total cultivated land ..... 298.174 acres

Net cropped area in the kharif season ..... 179.077 acres

Crops	Area in acres	Percentage to the total cultivated land	Percentage to the net cropped land	Total percentage to the total cultivated land	Total percentage to the net cropped land
Grain crops				50.98	84.86
Rice (broadcast)	56.719	19.02	31.67		
Rice (transplanted)	15.688	5.26	8.76		
Big millet and pulses	43.138	14.48	24.12		
Bulrush millet & pulses	25.443	8.56	14.20		
Pulses (sown alone)	3.629	1.21	2.03		
Big millet	2.382	0.80	1.33		
Bulrush millet	1.906	0.64	1.07		
Bulrush millet, big mellet & pulses	1.906	0.64	1.07		
Maize	0.781	0.26	0.44		
Small millet	0.313	0.11	0.17		
Other crops				9.08	15.14
Sugarcane	14.968	5.02	8.36		
Fodder	7.188	2.41	4.01		
Sweet potato	2.113	0.70	1.18		
Groundnut	1.938	0.65	1.08		
Vegetables	0.884	0.29	0.50		
Sannhemp	0.031	0.01	0.01		
Fallow	119.097	39.94		39.94	
Total	298.174	100.00	100.00	100.00	100.00

The above Table shows that 50.98 per cent of the total land available for cultivation is under grain crops, and only 9.08 per cent is under non-cereal crops; besides, a large land, 39.94 per cent, is under fallowing in the kharif season. Out of the net cropped area in the season being 179.077 acres, the 84.86 per cent is devoted to the grain crops while 15.14 per cent to the non-cereal crops.

Among the grain crops, the crops of rice (both broadcast and transplanted) are dominating with a total percentage of 40.43 of the net cropped land. The second largest crop is big millet mixed with pulses (pigeon pea) and the next is bulrush millet mixed with pulses

Maize is one of the smallest crops among non-cereal crops. Sugarcane occupies 8.36 per cent of the net cropped land. Fodder is the next important crop, 4 per cent; while sweet potato, groundnut, vegetables and sannhamp are the smaller crops.

LAND UTILIZATION IN THE RABI SEASON

The distribution of various crops of the rabi season, 1962-63, and other uses of land have been shown in Fig. 110. A summary of the area under each crop and its percentages to the total cultivated land and to the net cropped land in the rabi season are given in Table LXXXVIII.

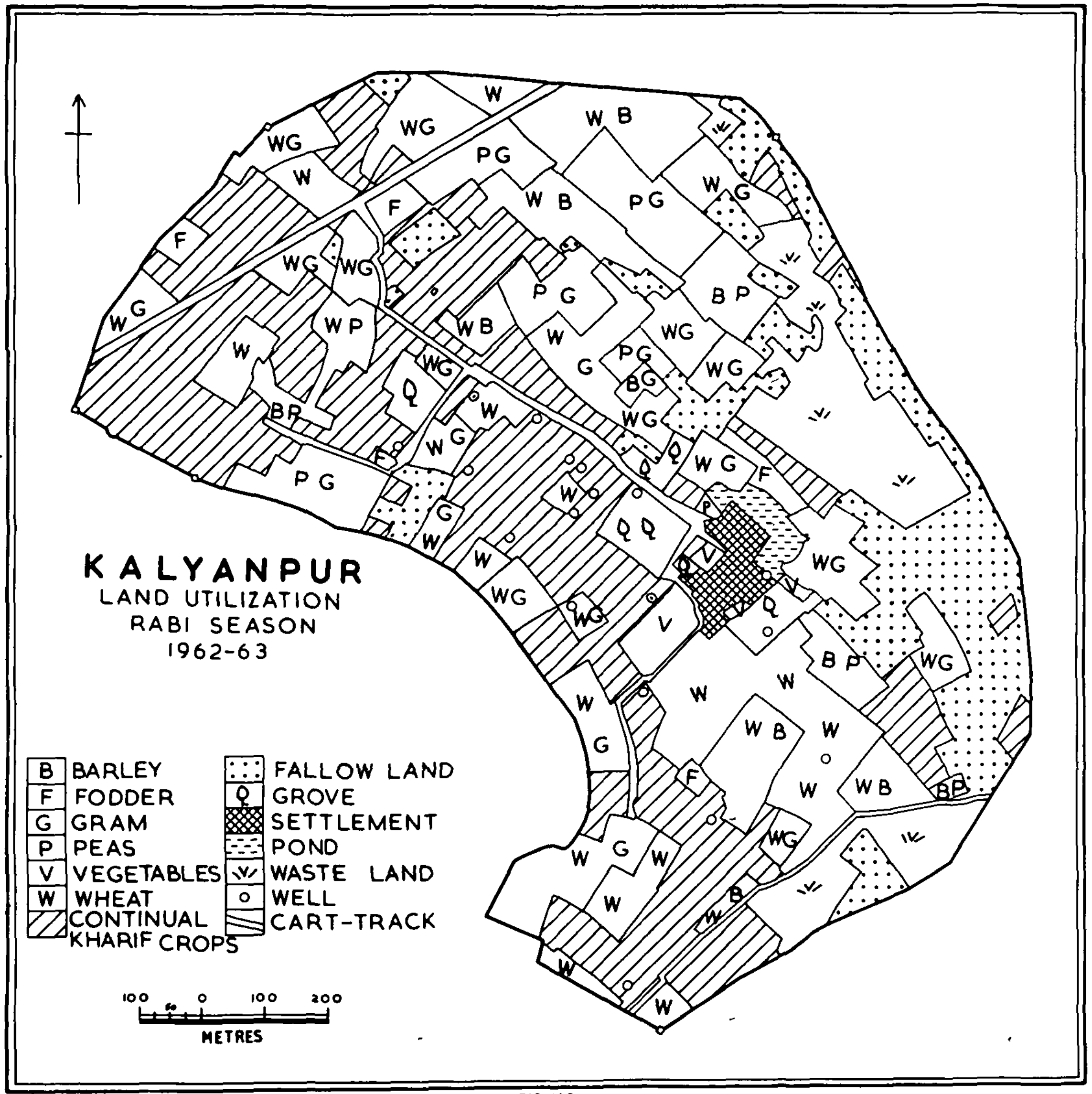
KALYANPUR
LAND UTILIZATION
RABI SEASON
1962-63
B BARLEY
F FODDER
G GRAM
P PEAS
V VEGETABLES
W WHEAT
CONTINUAL KHARIF CROPS
FALLOW LAND
GROVE
SETTLEMENT
POND
WASTE LAND
WELL
CART-TRACK
100 0 100 200
METRES

FIG 110

TABLE LXXXVIII

Total cultivated land ..... 298.174 acres

Net cropped area in the rabi season ..... 137.940 acres

Crops	Area in acres	Percentage to the total cultivated land	Percentage to the net cropped land	Total percentage to the cultivated land	Total percentage to the net cropped land
GRAIN CROPS				44.07	95.24
Wheat-gram (mixed)	55.219	18.52	40.03		
Wheat	25.938	8.70	18.80		
Peas-gram(mixed)	19.344	6.49	14.02		
Wheat-barley(mixed)	16.188	5.44	11.74		
Barley-peas(mixed)	10.250	3.44	7.43		
Wheat-peas(mixed)	2.219	0.74	1.61		
Barley-gram(mixed)	1.938	0.65	1.40		
Peas	0.281	0.09	0.21		
OTHER CROPS				2.20	4.76
Vegetables	3.469	1.16	2.52		
Fodder	3.094	1.04	2.24		
Continual kharif crops	88.446	29.66		29.66	
FALLOW	71.788	24.07		24.07	
Total	298.174	100.00	100.00	100.00	100.00

The above Table shows that 44.07 per cent of the total land under plough is under grain crops and only 2.2 per cent is under non-cereal crops in the *rabi* season. Out of the total area under cultivation, 29.66 per cent is occupied by the continual *kharif* crops and 24.07 per cent is under fallowing.

It is remarkable that 95.24 per cent of the net cropped land is occupied by the grain crops and 4.76 per cent by other crops during the season.

Among grain crops, the crop of wheat-gram (mixed) occupied the largest part of the net-cropped land being 40.03 per cent; wheat is the second, 18.8 per cent, and crop of peas-gram (mixed) is the third, being 14.02 per cent while the mixed crops of wheat-barley and barley-peas have comparatively small areas; wheat-peas, barley-gram (mixed) and peas have smallest areas among grain crops. The crops of vegetables and fodd occupy small areas.

It will be seen from the above Tables that the area under fallowi in the <u>rabi</u> is less than that of the <u>kharif</u> season, (24 per cent : 40 per cent respectively). A large area in the <u>rabi</u> season is still occupied by the continual kharif crops, being 88.446 acres under pulses and sugarcane.

DOUBLE CROPPED LAND

The area cropped in the kharif as well as in the rabi seasons, known as the double cropped land, is shown in Fig. III. The double cropped land in the village is 52.063 acres or 17.5 per cent of the total cultivated land in the village.

All the double cropped area possesses good quality (A) land. The area under double cropping may vary from year to year in accordance with adequate or inadequate application of manuring and irrigation to the land. The per capita share of the double cropped land in the villa is 0.517 acre.

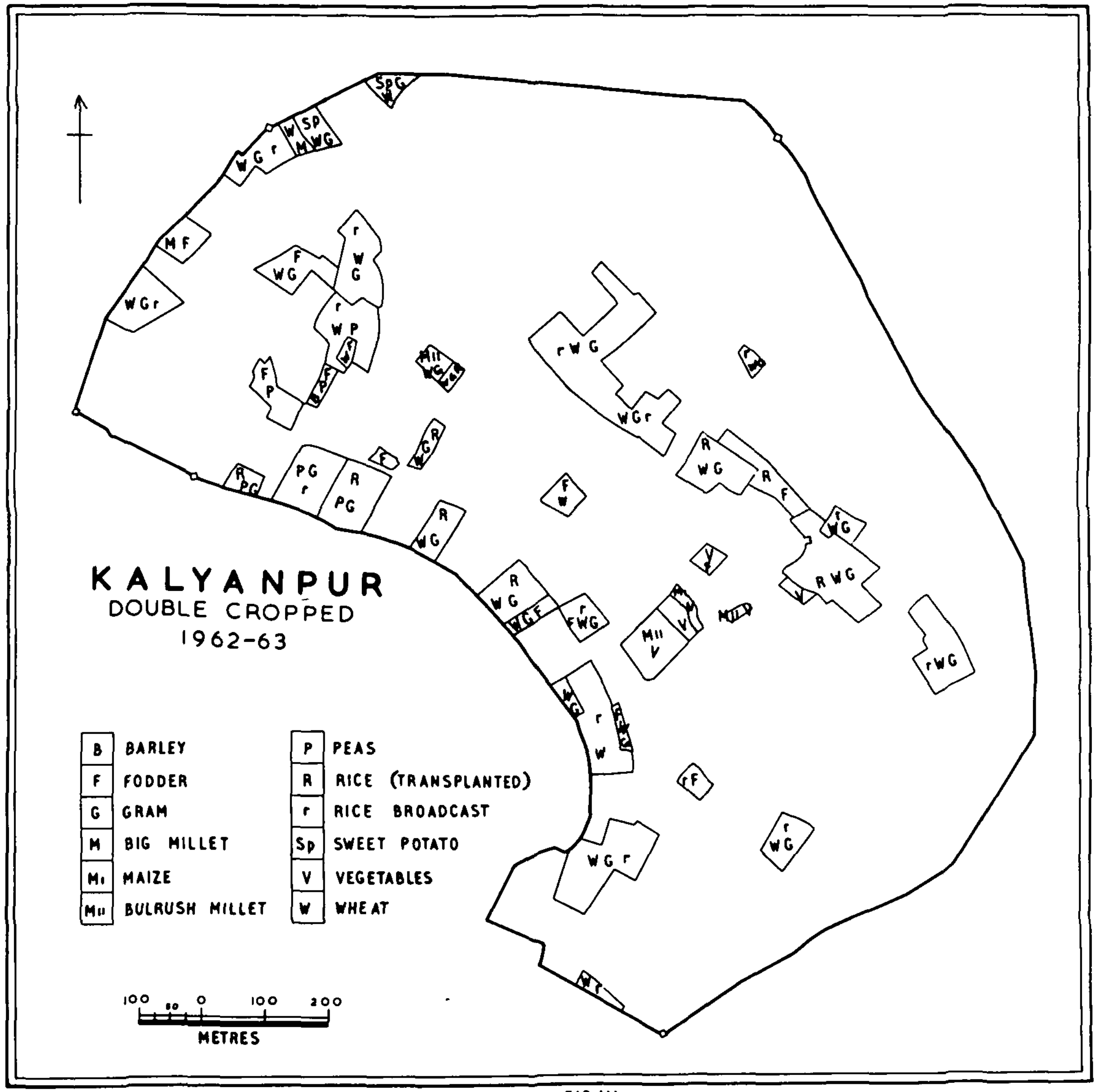
KALYANPUR
DOUBLE CROPPED
1962-63
B BARLEY
F FODDER
G GRAM
M BIG MILLET
Mı MAIZE
Mıı BULRUSH MILLET
P PEAS
R RICE (TRANSPLANTED)
r RICE BROADCAST
Sp SWEET POTATO
V VEGETABLES
W WHEAT
100 50 0 100 200
METRES

FIG III

ROTATION OF CROPS

Some rotations of crops are adopted in the village which are related to the characteristics of land and soil, rainfall, availability of manures and irrigation facilities. However, changes occur according to needs and facilities of a cultivator.

The good quality (A) lands are most usefully cropped in successive seasons, usually for years. They are as follows:

Crop year	Kharif season	Rabi season
First year	Rice (transplanted/rice broadcast)	Wheat-gram/wheat
Second year	Rice (broadcast)/ Sugarcane	Wheat-gram/peas-gram/ wheat/sugarcane (contd.)
Third year	Rice (broadcast)/ Sugarcane (contd.)	Peas-gram/barley-gram/ sugarcane.

Sugarcane is grown only in this type of land and continues usually for two crop-years.

The crop-rotation in the medium quality (B_1) lands remains generally as follows. It is cropped in either the kharif season or the rabi season only:

Crop year	Either in kharif season	or in rabi season
First Year	Rice (transplanted)	Wheat-gram
Second Year	Rice (broadcast)	Barley-gram/peas-gram
Third Year	Millets/rice (broadcast)	Peas/barley-gram/peas-wheat.

But the crop rotation in the medium quality B_{11} lands is somewhat different from the above two. It remains as follows:

Crop Year	Either in the kharif season	or in the rabi seaso
First Year	Millets/millets with pulses	Wheat-barley/peas-gram.
Second Year	Millets/fodder/sweet potato/ groundnut	Barley-peas/wheat-peas/ wheat-peas-gram.
Third Year	Millets/maize/pulses	Peas/barley-gram/ Wheat-barley-gram.

It will be seen that the B_{11} quality lands have quite different rotation of crops. It is cropped in either the kharif season or the rabi season and the land is left fallow in the other season.

The dominating crops in the B_1 lands are rice (transplanted or broadcast), and gram mixed with either wheat, peas or barley. But the predominant crops in the B_{11} types of lands are millets, fodder, maize, pulses and mixed crops of wheat-barley, peas-gram, barley-peas, wheat-peas barley-gram, wheat-peas-gram, and peas.

LAND USE AND POPULATION

The total population of the village is 315. The total acreage and the per capita share in the total cultivated land, net cropped land of the kharif and rabi seasons, gross cultivated land and the double cropped land are given in Table LXXXIX.

TABLE LXXXIX

Total population of the village Kalyanpur : 315

(Area in acres)

	Total area of the village	Total land available for cultivation[1]	Net cropped land in the kharif season	Net cropped land in the rabi season	Gross cultivated land (of both kharif & rabi)	Double cropped land
	331.752	298.174	179.077	137.940	317.017	52.063
Land per head of population	1.053	0.947	0.568	0.438	1.006	0.165

It will be seen from the above Table that per capita share of the total land under cultivation is 0.947 acre, and owing to large fallowing in the kharif season it reduces to .568 acre; further, it is again reduced to 0.438 acre in the rabi season due to both seasonal fallowing and large occupation of land by the continual kharif crops in the rabi season. The actual amount of land which supports one person in the village is the gross cultivated land which is a sum total of net cropped lands in both kharif and rabi season. The per capita gross cultivated land amounts to be 1.006 acres. But the double cropped land per capita amounts to only 0.165 acre.

Out of the total population, 95.5 per cent are primary rural or the cultivators, and the rest are secondary rural who depend upon the field produce of the former through their subsidiary services; they include potter, tailor, shop-keeper and carpenter.

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1. It includes 33.22 acres of cultivated land which remained under annual fallowing.

CALORIC INTAKE

The yield rates of various crops produced in the *kharif* and *rabi* seasons in the village are given in Table XC - A. On the basis of yields of various crops, the total production of each of them in the village has been computed by the writer and thus the total caloric consumption per head of population per day has been inferred in Table XC. B.

TABLE XC - A

Crops	Yield per acre (in kilograms)
Rice (broadcast) unhusked	485
Rice (transplanted) unhusked	597
Big millet (when sown with pulses)	93
Bulrush millet (when sown with pulses)	112
Pulses (when sown with millets)	84
Pulses (sown alone)	121
Big millet (sown alone)	206
Bulrush millet (sown alone)	149
Maize	140
Small millet	149
Sugarcane (gur)	801
Sweet Potato	1119
Wheat	261
Peas	336
Wheat-gram	302
Peas-gram	354
Barley-peas	279
Wheat-barley	263
Barley-gram	302

The medium quality (B_1) lands, being inferior to the A quality lands and superior to the B_{11} lands, are particular for rice and gram crops.

TABLE XG B
FOOD BALANCE SHEET
Village KALYANPUR
(in Kilograms)

Population 315

Year 1962-63

Commodity	Production	Total Production	Export	Import	Available Supply	Seed	Food (Gross)	Extraction rate per cent	Food (Net)	Per head Consumption: Kilograms per year	Grams per day	Calories per day
Rice (Broadcast)	27508.7	27508.7	9169.6	-	18339.1	1587.6	16751.5	$66\frac{2}{3}$	11167.7	35.449	97.1	346.6
Rice (Transplanted)	9365.7	9365.7	-	-	9365.7	146.4	9219.3	$66\frac{2}{3}$	6146.2	19.512	53.5	192.1
Big millet (sown with pulses)	4837.1)											
Big millet (sown alone)	490.7)	5327.8	821.0	-	4506.8	362.8	4144.0	95	3936.8	12.498	34.2	117.3
Bulrush millet	284.0)											
Bulrush millet (sown with pulses)	2849.6)	3133.6	-	-	3133.6	81.9	3051.7	95	2899.1	9.203	25.2	87.7
Big millet and bulrush millet (sown with pulses)	194.4	194.4	-	-	194.4	5.4	189.0	95	179.6	0.570	1.6	5.5
Pulses (sown alone)	439.1)											
Pulses (sown with millets)	5925.1)	6364.2	-	-	6364.2	108.9	6255.3	95	5942.5	18.865	51.7	177.3
Maize	109.3	109.3	-	-	109.3	6.6	102.7	89	91.4	0.290	0.8	2.8
Small millet	46.6	46.6	-	-	46.6	1.6	45.0	95	42.7	0.136	0.4	1.4
Sugar (gur)	11989.4	11989.4	1199	-	10790.4	1257.4	9533.0	-	9533.0	30.263	82.9	290.9
Sweet potato	2364.4	2364.4	393.0	-	1971.4	-	1971.4	83	1636.3	5.194	14.2	13.8
Wheat gram	16676.1	16676.1	416.9	-	12507.1	2838.7	9668.4	92	8894.9	28.238	77.4	267.8
Wheat	6769.8	6769.8	-	-	6769.8	1310.2	5459.6	90	4913.6	15.598	42.7	142.6
Peas gram	6847.8	6847.8	-	-	6847.8	1083.1	5764.7	95	5476.5	17.386	47.6	167.5
Wheat barley	4257.4	4257.4	-	-	4257.4	825.6	3431.8	80	2745.4	8.715	23.9	79.6
Barley peas	2859.8	2859.8	-	-	2859.8	547.3	2312.5	82	1896.3	6.020	16.5	55.9
Wheat peas	663.5	663.5	-	-	663.5	119.2	544.3	92	500.8	1.589	4.3	14.5
Barley gram	585.3	585.3	-	-	585.3	104.1	481.2	82	394.6	1.252	3.4	11.7
Peas	94.4	94.4	-	-	94.4	15.7	78.7	95	74.8	0.237	0.6	2.1
Total												1977.1

The B_{11} lands are comparatively inferior in productivity due to low provisions of manuring and irrigation.

Table XC - B gives the total yield of each crop produced in the village in 1962-63. There is no import of any foodstuff from outside. After the deduction of exported amounts and preserved seeds, and applying the food extraction rates, the total food available from each crop has been distributed to ascertain per head per day consumption.

The calories, calculated from the above consumption, amount in total to 1977 per head per day, this denotes a state of under-nutrition as regards caloric intake of food produced from the land.

The large caloric intake of food is in order from rice (broadcast), sugar (gur), wheat-gram, rice (transplanted), pulses (pigeon pea), peas-gram, wheat and big millet. Other crops like bulrush millet, maize, sweet potato and mixed crops of wheat-barley, barley-peas and barley-gram are smaller crops, yet they contribute to the total number of calories considerably.

POTENTIAL PRODUCTION UNIT

The various types of agricultural lands in the village have been evaluated to work out their potential productivity on the basis of varying yields of crops. Table XC I gives the relative ratings of different types of cultivated and waste lands; and total numbers of potential production units have been calculated for each of them.

TABLE XC I

Average yield per acre of normal standard farmland
in the village : 435 kilograms or 1 P.P.U.

Type of land	Area in acres	Average yield in kilograms per acre	Productivity rating per acre	Number of P.P.U.
A	67.031	508	1.17	78.426
B_1	36.719	435	1.00	36.719
B_{11}	194.424	288	0.66	128.321
C	11.937	0	0	0
Total	310.111			243.466

It will be seen from the above Table that the total Potential Production Units of the whole village are less as compared to the total area of both cultivated and uncultivated lands of the village. They are less than even cultivated land.

The good quality lands, 22.4 per cent of the total cultivated land, are equal to 1.17 P.P.U. per acre which sufficiently contribute to the total number of P.P.U. but owing to the smaller area than the B_{11} lands, the A quality lands do not provide a large number of P.P.U. to the total number of P.P.U.

The medium quality B_1 lands possess the normal standard farm-lands and this type of land has the least area among cultivated lands. The B_1 lands are equal to 1 P.P.U. per acre.

The largest part of the cultivated areas is that of the B_{11} quality lands which is equal to 0.66 P.P.U. per acre. As compared to the total acreage of this type of land, it contributes a smaller number of P.P.U. to the total.

The poor quality (C) lands have neither any crop production nor provide P.P.U. This has also decreased the total number of P.P.U. in comparison with the total of the cultivated area and the poor quality lands.

In this village too, the increase of facilities of irrigation and sufficient manuring may play a very important role in improving the potential productivity and thus the potential productivity of B_{11} lands may well be raised to at least the productivity of B_1 lands. In the same way, the potential productivity of a considerable part of B_1 lands may be developed into that of A quality lands, if the lands are free from bad drainage and waterlogged conditions and if the manured soil or crop is not washed off by a possible flood in the season of rains.

The inadequacy of irrigation facilities to rabi crops and insufficiency of manuring in both the seasons during a prolonged period of years do certainly affect the fertility, productivity and grade of the lands.

LAND UTILISATION IN MOA[illegible]NAGAR

LOCATION:

The village Moa[illegible]nagar lies in the Tilhar Tahsil and is located at 79° 29' 50" E.long. and 27° 52' [illegible] N.lat. The alluvial plain in which the village is situated is under the complete influence of the [illegible] river. The river has formed the [illegible] land. The general slope of the village [illegible] is towards [illegible] draining into the [illegible]. [illegible] is bounded by the villages of [illegible] in the west, [illegible] in the south-east, [illegible] and [illegible] in the east, Mathra in the north, and [illegible] in the south. (Fig. 11[illegible]).

The only big village near it is Khera Bajhera at a distance of about 4 kilometres in the north. The village is connected with the surrounding villages through the cart-tracks. The [illegible]andhoi, a seasonal stream, flows in the [illegible] of the village and during the rainy season, the communication and transport from [illegible] to the eastern villages become very [illegible] difficult.

CLIMATE:

There is no climatic data recorded for the village. The rainfall data, however, recorded at the [illegible] of Tilhar Tahsil are approximately the same as the [illegible] conditions of the village. [illegible] of rainfall for the *kharif* and *rabi* seasons ([illegible] III and IX) [illegible] in the [illegible] of the village [illegible].

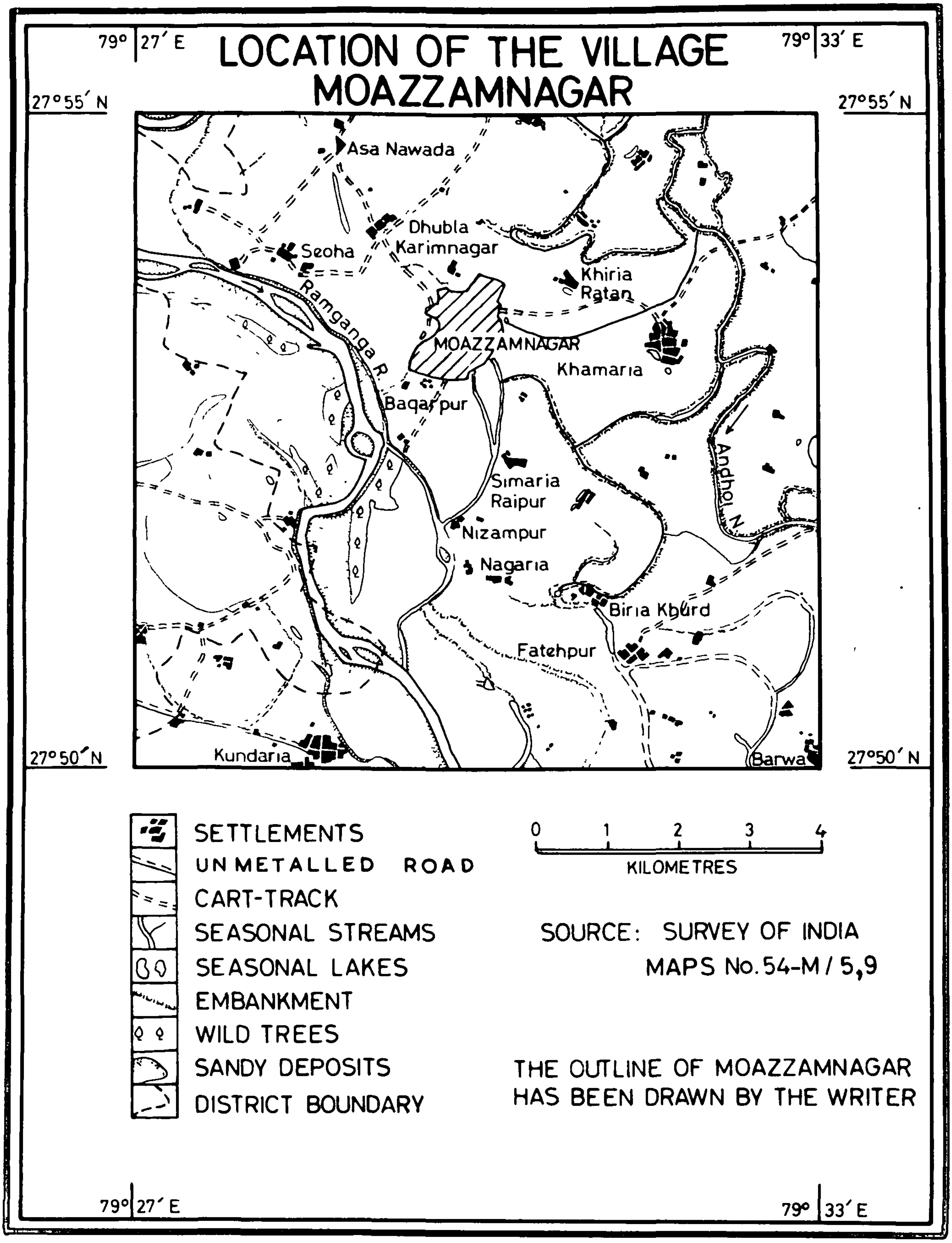
79° 27′ E
LOCATION OF THE VILLAGE
MOAZZAMNAGAR
79° 33′ E
27°55′ N
27°55′ N
Asa Nawada
Dhubla
Seoha
Karimnagar
Khiria
Ratan
Ramganga R.
MOAZZAMNAGAR
Khamaria
Baqarpur
Andhol N.
Simaria
Raipur
Nizampur
Nagaria
Biria Khurd
Fatehpur
Kundaria
Barwa
27°50′ N
27°50′ N
SETTLEMENTS
UNMETALLED ROAD
CART-TRACK
SEASONAL STREAMS
SEASONAL LAKES
EMBANKMENT
WILD TREES
SANDY DEPOSITS
DISTRICT BOUNDARY
0 1 2 3 4
KILOMETRES
SOURCE: SURVEY OF INDIA
MAPS No. 54-M / 5,9
THE OUTLINE OF MOAZZAMNAGAR
HAS BEEN DRAWN BY THE WRITER
79° 27′ E
79° 33′ E

FIG. 112

It will be noticed from Table XLVIII that the first two months of the *kharif* season, June-July, received quite scanty rainfall, while August-September, received a sufficient rainfall being quite above the monthly averages. The month of October remained rainless. During the season as a whole the rainfall was 210 millimetres less than the average. The same rainfall conditions are recorded at Dataganj (Table XXXII).

The good rainfall in August and September was very useful for the crops of millets, pulses and rice.

Further, the Table XLIX (of *rabi*) shows that first two months of the season, November--December, were rainless. It was January when the rainfall was sufficiently more than monthly average which was very much useful for *rabi* crops. February received less than half of the month's average. The total seasonal rainfall was below the average. However, the *rabi* crops were on an average satisfactory owing to January- and March- rainfall and irrigation.

LAND CLASSIFICATION:

The total land under plough has been classified with respect to crop productivity into good quality (A) lands, the medium quality (B1 and BII) and the poor quality (C) lands (Fig.113).

The good quality (A) lands, possessing an area of 42.43 acres or 27.2 per cent of the total land under cultivation, include the double cropped area which is mostly found in the surrounding of the settlement. The regular application of human faeces is the chief source of increasing fertility.

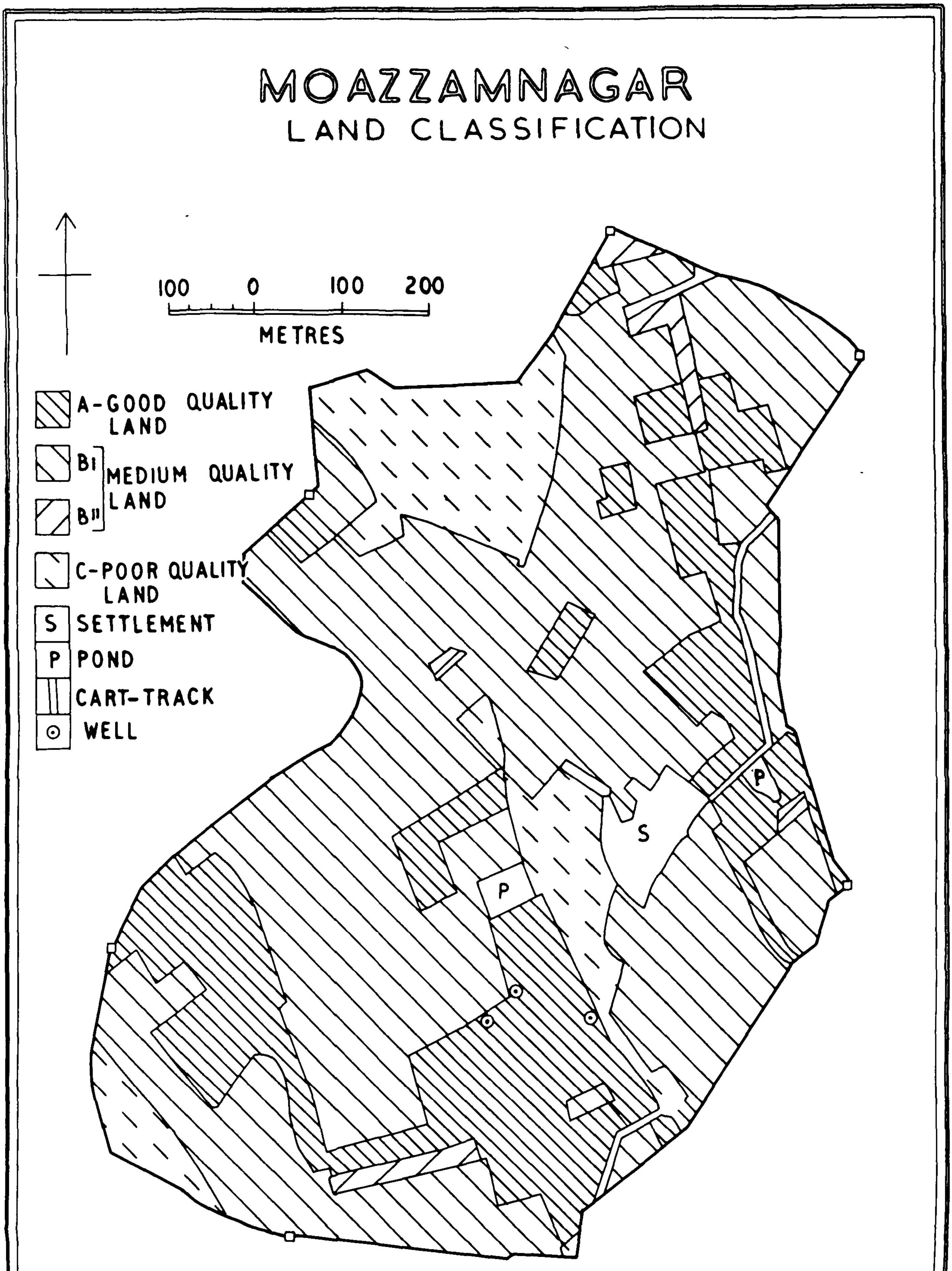
MOAZZAMNAGAR
LAND CLASSIFICATION
100 0 100 200
METRES
A-GOOD QUALITY LAND
BI
BII
MEDIUM QUALITY LAND
C-POOR QUALITY LAND
S SETTLEMENT
P POND
CART-TRACK
WELL
P
S
P

FIG.113

The B_1 quality lands, with an area of 75.79 acres or 48.6 per cent of the total cultivated land in the village, are cropped in either the kharif or the rabi season and are left fallow for the other season. This shows the inferiority of B_1 lands to the good quality (A) lands.

But, on the other hand, those cultivated lands which are put to fallowing[1] in both the kharif and rabi seasons for recuperation of fertility are BII lands which are inferior to the B1 lands. The area of BII lands is 35.66 acres or about 23 per cent of the total land under plough.

The poor quality (C) lands, being 6.11 acres or 3.67 per cent of the total area of the village, do not produce any crop and are known as banjar or unproductive lands. Those unproductive lands which suffer from salt or reh **efflorescence** are known as ' Usar' lands.

IRRIGATION:

The cultivated lands of the village have been divided into irrigated and unirrigated portions. Fig. 114 shows the areas irrigated in the kharif and the rabi seasons.

The crops of transplanted rice and vegetables are irrigated in the kharif while the rabi crops which need irrigation are irrigated where facilities are available. Most of the rabi crops irrigated are wheat-gram mixed, peas and vegetables.

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1. The fallow land is locally known as ' parti' in the village.

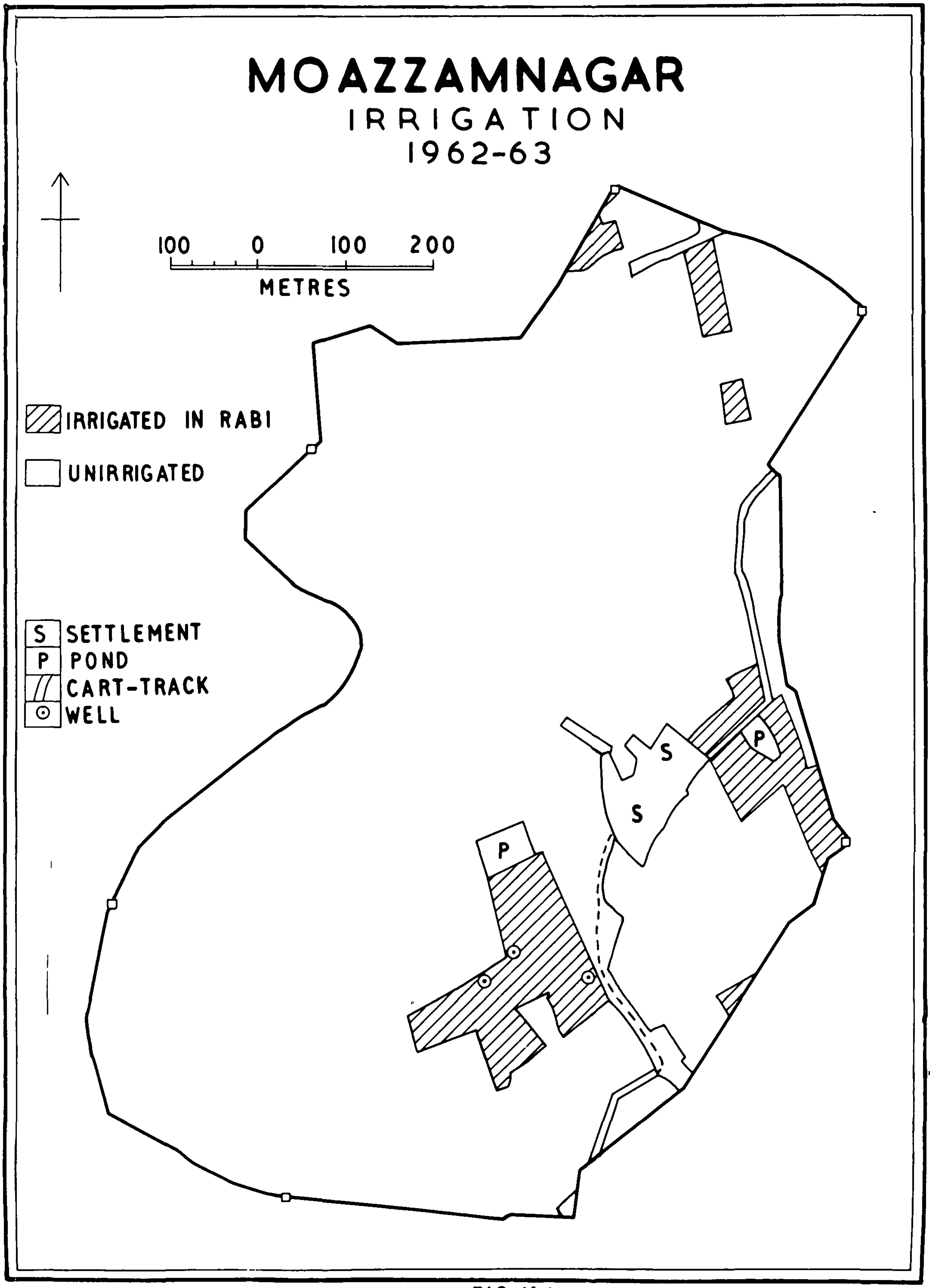
MOAZZAMNAGAR
IRRIGATION
1962-63
100 0 100 200
METRES
IRRIGATED IN RABI
UNIRRIGATED
S SETTLEMENT
P POND
CART-TRACK
WELL
S
S
P
P

FIG. 114

The sources of irrigation in the village are ponds and wells—masonry and non-masonry. The <u>rahat</u> or the Persian wheel is fitted with two masonry wells, while irrigation from the temporary non-masonry wells is done by <u>dhekli</u> as well as <u>charas</u> .

A masonry well on an average can irrigate 0.6 acre of land in a day and 0.5 acre is irrigated from a pond. The <u>boke</u> lift system is used in irrigation from a pond. A <u>charas</u> irrigates 0.50 acre in a day. Only bullocks are used in drawing a <u>rahat</u> or <u>charas</u> while labourer and the cultivator himself are engaged in <u>boke</u> system of irrigation.

The cost of irrigation from a masonry well is thirteen rupees and fifty paise per acre while from a pond or non-masonry well, the cost per acre comes to ten rupees. A non-masonry well is dug where there is neither a pond nor a masonry well.

LAND UTILIZATION

The lands under cultivation and other uses are depicted in Fig.115. The areas of various uses of land in the village and their individual percentage to the total area of the village are given in Table XCII.

It will be seen from Table XCII that 93.48 per cent of the village area is under plough. The waste land, being largest among non-agricultural lands, is 3.67 per cent. The 0.84 per cent of the village area is under cart-tracks.

Area occupied by pond is 0.46 per cent. The shapes of the fields are generally rectengular or quadrilateral. The fields in the northern, north-eastern and southeastern parts of the village are comparatively smaller

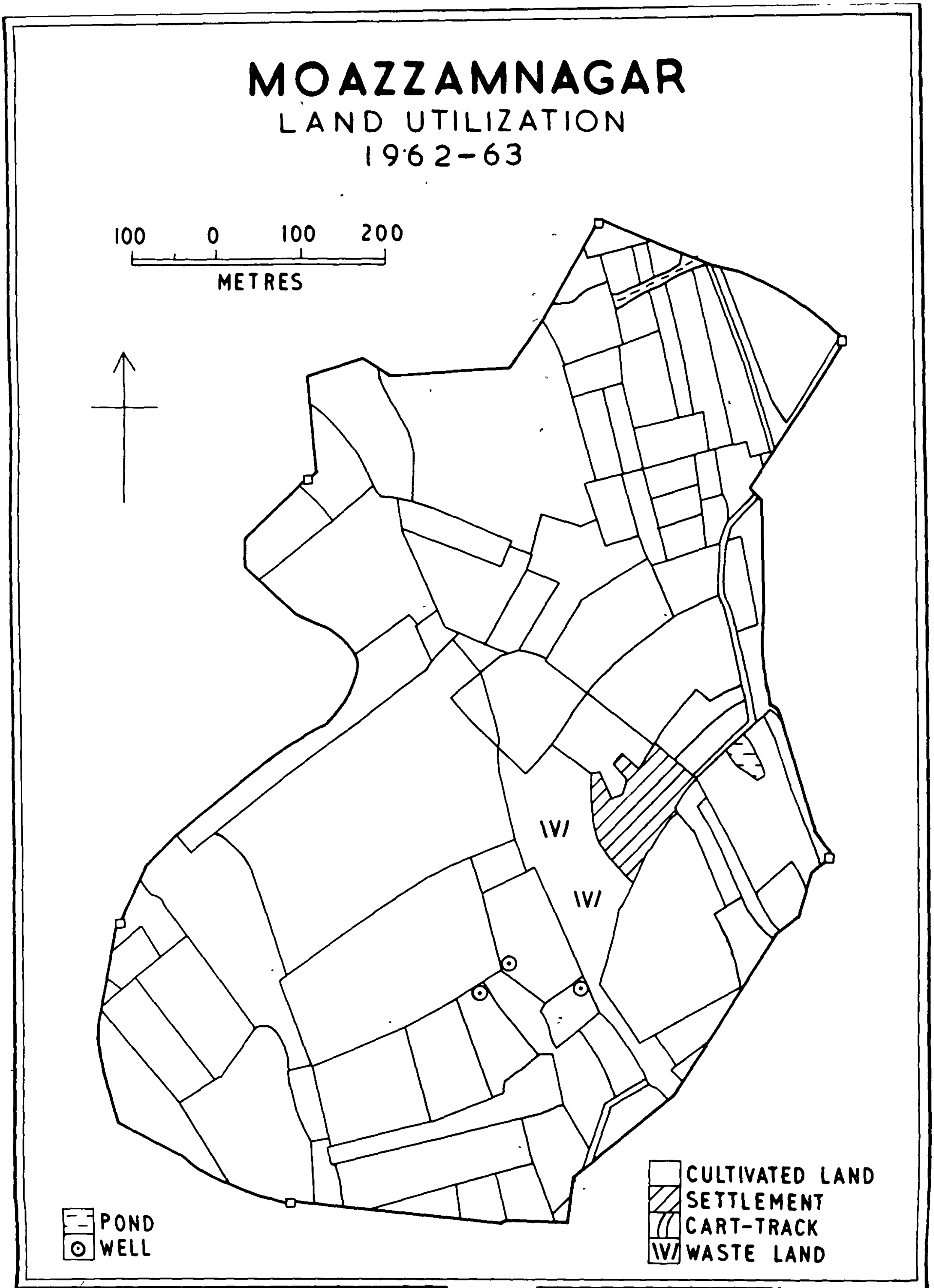
MOAZZAMNAGAR
LAND UTILIZATION
1962-63
100 0 100 200
METRES
\V/
\V/
POND
WELL
CULTIVATED LAND
SETTLEMENT
CART-TRACK
WASTE LAND

FIG. 115

in size than the middle and western parts. Numerous heaps of dung-cakes piled up especially for household fuel purposes, are found outside the settlement of the village.

Big fields are temporarily divided to grow different crops in a season, generally in the western part of the village.

TABLE XCII

Total area of the village ... 166.58 acres

Use of land	Area in acres	Percentage to the total area
Cultivated land	155.72	93.48
Ponds	0.77	0.46
Wasteland	6.11	3.67
Settlement	2.58	1.55
Cart-tracks	1.40	0.84
Total	166.58	100.00

LAND UTILIZATION IN THE KHARIF SEASON

The land under cultivation, with the distribution of kharif crops, fallowing and other uses of land in the _kharif_ season, 1962, are shown in Fig. 116. The summary of the area under each crop and percentages of each cropland in the _kharif_ to the total cultivated land and to the net cropped land are given in Table XCIII.

TABLE XCIII

Total cultivated land .... 155.72 acres
Net Cropped land in the kharif season 91.70 acres

Crops	Area in acres	% to the total cultivated land	% to the net cropped land	Total % to the total cultivated land	Total % to the net cropped land
Grain Crops				55.32	93.96
Big millet and pulses	36.83	23.65	40.16		
Rice (transplanted)	11.56	7.42	12.61		
Rice (broadcast)	7.84	5.03	8.55		
Bulrush millet & pulses	10.50	6.74	11.45		
Other pulses	16.61	10.67	18.11		
Small millet	2.82	1.81	3.08		
Other Crops				3.56	6.04
Fodder	4.54	2.92	4.95		
Sweet Potato	0.60	0.38	0.65		
Vegetables	0.40	0.26	0.44		
Fallow	64.02	41.12		41.12	
Total ...	155.72	100.00	100.00	100.00	100.00

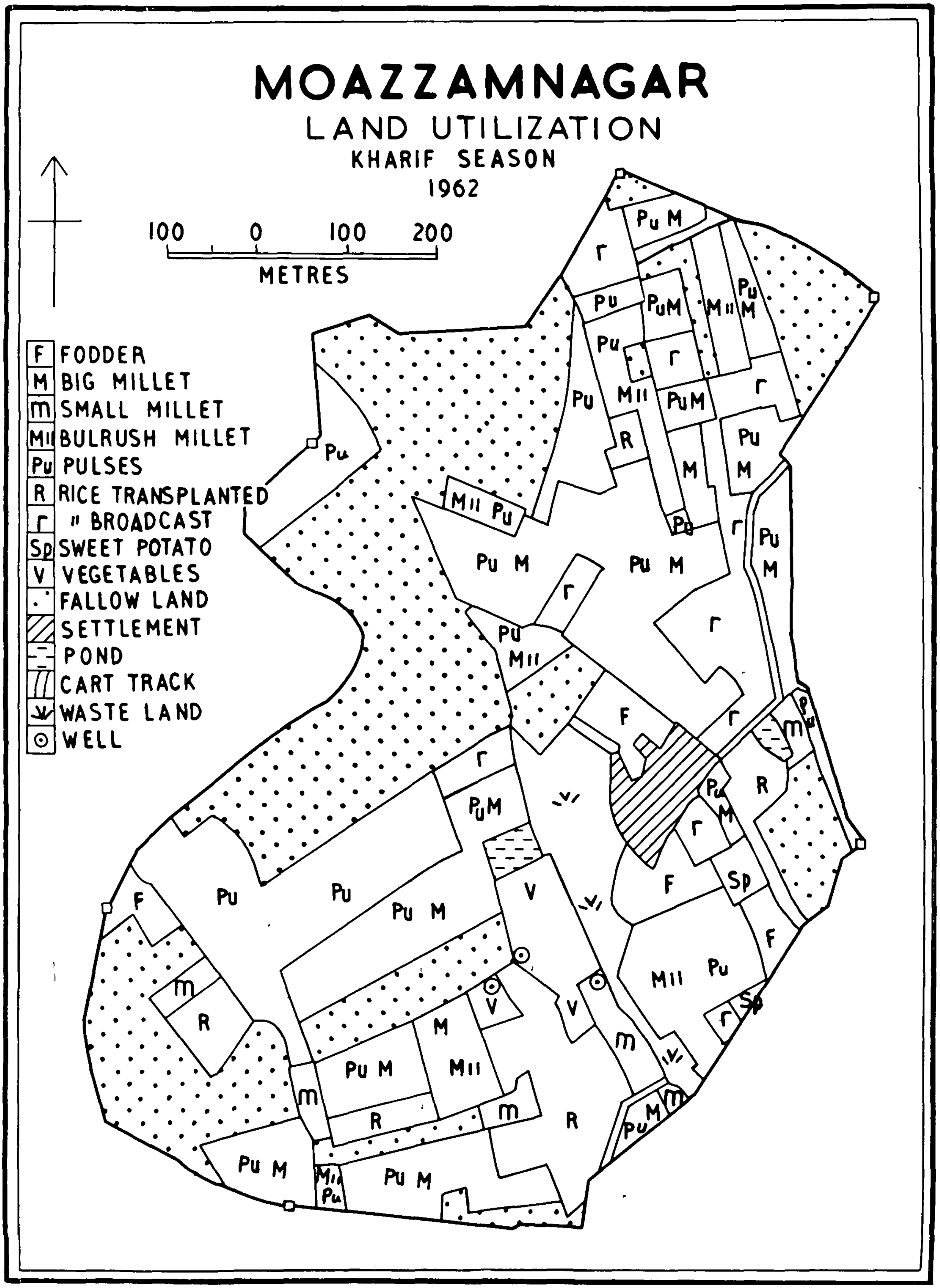
MOAZZAMNAGAR
LAND UTILIZATION
KHARIF SEASON
1962
100 0 100 200
METRES
F FODDER
M BIG MILLET
m SMALL MILLET
MII BULRUSH MILLET
Pu PULSES
R RICE TRANSPLANTED
r " BROADCAST
Sp SWEET POTATO
V VEGETABLES
FALLOW LAND
SETTLEMENT
POND
CART TRACK
WASTE LAND
WELL

FIG. 116

The above table reveals that 58.88 per cent of the total cultivated land is cropped in the *kharif* season, which includes 55.32 per cent under the grain crops and 3.56 per cent under non-cereal crops. It is also remarkable that a large area, 41.12 per cent, is fallow in the *kharif* season.

Out of the net cropped land in the kharif season, 93.96 per cent is under the grain crops and only 6.04 per cent under non-cereal crops.

Among the grain crops, big millet mixed with pulses (pigeon pea) is the largest crop being 40 per cent of the net cropped land, and if other millets and pulses are also included, their percentage becomes 72.8 of the net cropped land in the kharif season as compared to the rice which occupied 21.16 per cent which indicates that the shortage of rainfall in first two months of the crop season led the cultivators to grow more millets and pulses than rice.

Among non-grain crops, fodder is the greatest non-cereal crop which occupies only 4.95 per cent of the net cropped land. The sweet potato and vegetables are the smallest crops.

LAND UTILIZATION IN THE RABI SEASON

The distribution of various rabi crops of 1962-63 and other uses of land are shown in Fig.117. Table XCIV gives a summary of the area under each crop and its percentages to the total cultivated land and to the net cropped land in the *rabi* season.

Table XCIV reveals that about 45 per cent of the total cultivated land (41.93 per cent under the grain crops and 3.52 per cent under non-cereal crops) is cropped in the rabi season. A large area being 24.15 per cent of the total cultivated land is fallow in the rabi, besides a larger area, 30.40 per cent, remains under the continual kharif crops.

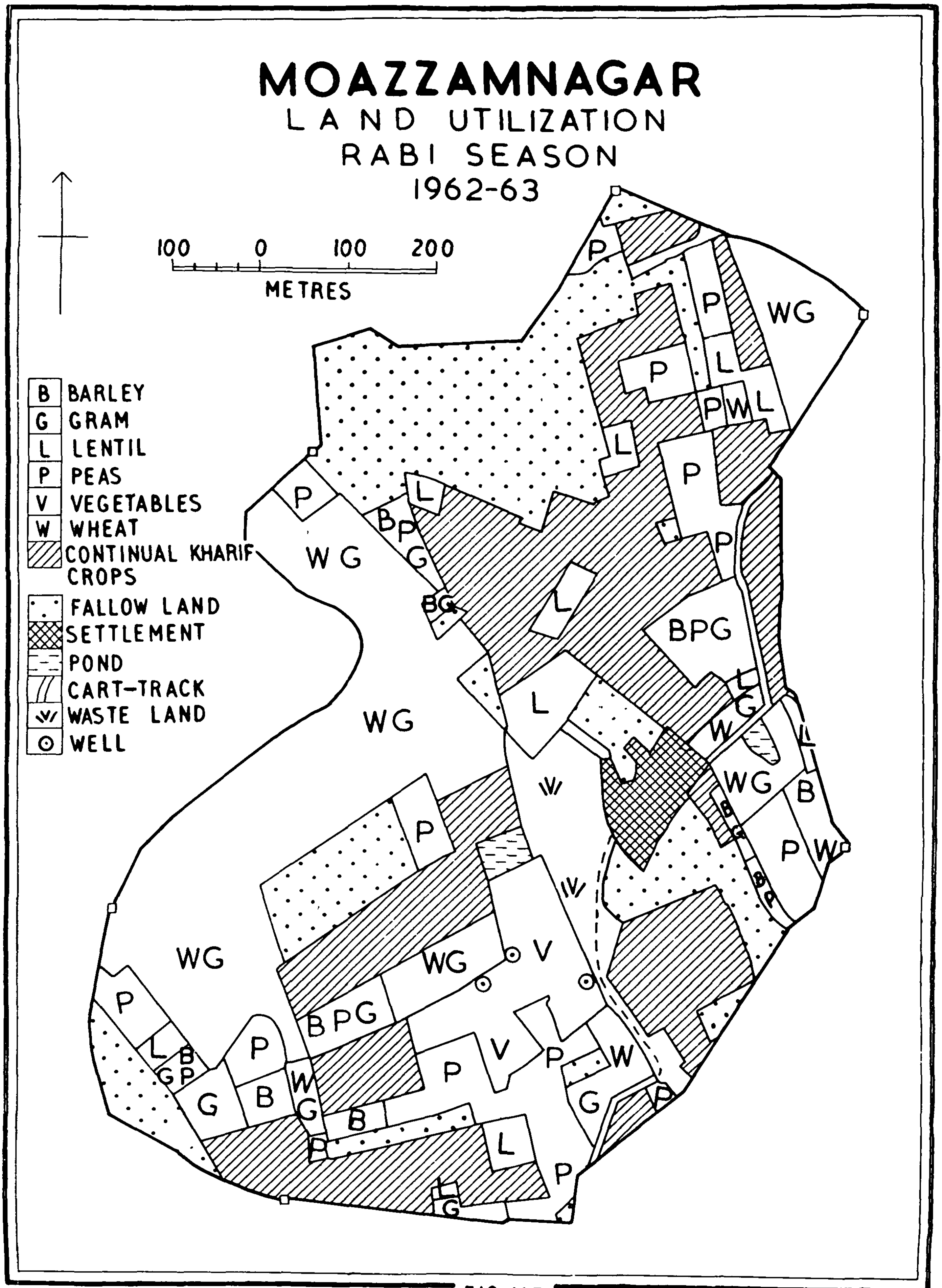
MOAZZAMNAGAR
LAND UTILIZATION
RABI SEASON
1962-63
100 0 100 200
METRES
B BARLEY
G GRAM
L LENTIL
P PEAS
V VEGETABLES
W WHEAT
CONTINUAL KHARIF CROPS
FALLOW LAND
SETTLEMENT
POND
CART-TRACK
WASTE LAND
WELL

FIG. 117

Table XCIV

Total Cultivated Land ... 155.72 acres

Net Cropped Land in the Rabi Season ... 70.79 acres

Crops	Area in acres	Percentage to the total cultivated land	Percentage to the net cropped land	Total percentage to the total cultivated land	Total percentage to the net cropped land
Grain Crops				41.93	92.25
Wheat-gram	33.82	21.72	47.78		
Peas	17.02	10.93	24.04		
Barley-peas-gram	5.59	3.59	7.89		
Lentil	4.46	2.86	6.30		
Gram	1.90	1.22	2.69		
Barley-peas-wheat	1.05	0.67	1.48		
Barley-peas	0.86	0.55	1.22		
Barley	0.60	0.39	0.85		
Other Crops				3.52	7.75
Vegetables	5.49	3.52	7.75		
Fallow	37.60	24.15		24.15	
Continual kharif Crops	47.33	30.40		30.40	
Total ...	155.72	100.00	100.00	100.00	100.00

Out of the net cropped area of the rabi season, 92.25 per cent is under grain crops and only 7.75 per cent under vegetables.

Among the grain crops, wheat-gram (mixed) is the largest crop being 47.78 per cent of the net sown area, giving second place to peas: 24.04 per cent. Barley-peas-gram (mixed), lentil and gram are the smaller crops, while barley-peas-wheat and barley-peas (mixed) and barley are the smallest crops.

The only non-cereal crop is of vegetables. A large area of 37.60 acres or 24.15 per cent of the cultivated area is under fallowing in the season. The continual kharif crop being pulses (pigeon pea) occupies the largest area, 47.33 acres or 30.4 per cent of the total land under cultivation.

There is no fodder or green manure crop in the rabi season. The needs of fodder are fulfilled by the straw obtained from the rabi crops, The straw of gram and peas is known as very energetic to cattle; besides, straw of wheat and wheat-barley is also used. The straw is often mixed with oilcakes generally for feeding buffaloes. During the growing period, the green plants of peas, with or without legumes, are generally used as fodder also.

DOUBLE CROPPED LAND

The land which is cropped in the kharif as well as in the rabi season, called double cropped land,[1] has an area of 42.43 acres or 27.2 per cent of the total land under cultivation in the village. The double cropped area possesses the good quality (A) land, (Fig.118). The area under double cropping may have little changes from year to year in accordance with the deficient or sufficient manuring and irrigation applied to the land. The per capita share of double cropped land is 0.345 acre.

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1. The double cropped land is known as '*dofasli*' area.

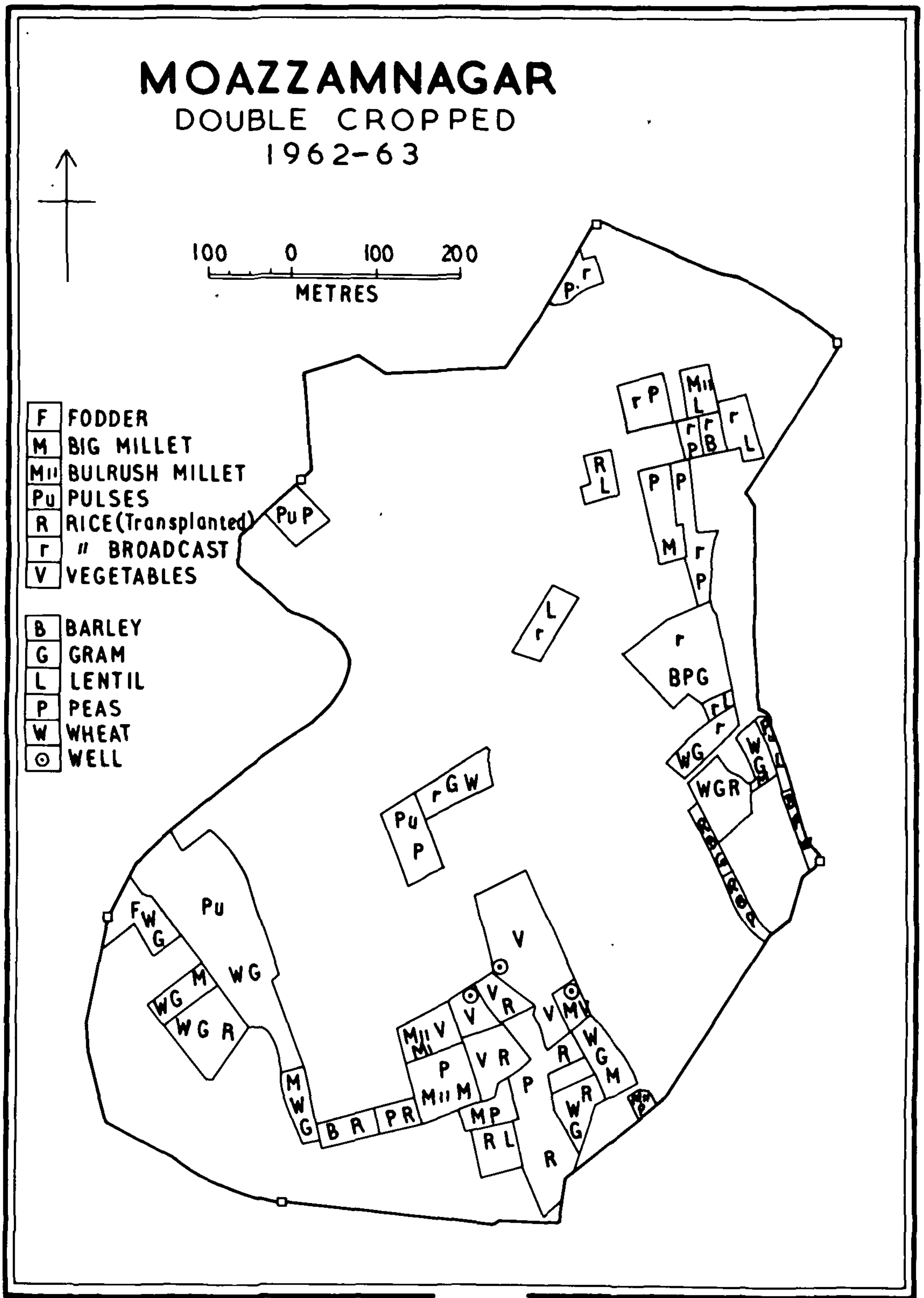
MOAZZAMNAGAR
DOUBLE CROPPED
1962-63
100 0 100 200
METRES
F FODDER
M BIG MILLET
M11 BULRUSH MILLET
Pu PULSES
R RICE (Transplanted)
r " BROADCAST
V VEGETABLES
B BARLEY
G GRAM
L LENTIL
P PEAS
W WHEAT
⊙ WELL

FIG. 118

ROTATION OF CROPS

The rotations of crops recognized in the village are the same as in the previous village. However, the changes in rotations do also occur according to needs and facilities of manures and irrigation.

The most usefully cropped land is the good quality (A) land which is cropped in successive seasons for years. Dominant crops of A quality lands are rice, gram (mixed with wheat, barley or peas). The medium quality lands are mostly cropped with millets, arhar (pigeon pea), black gram (urd) Phaseolus radiatus and green gram (moong) Phaseolus mungo, or barley, peas or lentil. The BII quality lands are generally put to fallowing for two or three seasons.

LAND USE AND POPULATION

The total population of the village is 123. Table XCV gives the total areas and the per capita share in each of the total cultivated land, net cropped lands in the kharif and rabi seasons, gross cultivated land and the double cropped land.

Table XCV

~~XXXX~~ Total Population of the Village ... 123
(Area in acres)

	Total area of the village	Total cultivated land available [1]	Net cropped land in the kharif season	Net cropped land in the rabi season	Gross cultivated land (both of kharif and rabi)	Double cropped land
	166.58	155.72	91.70	70.79	162.49	42.43
Land per head of population	1.354	1.266	0.745	0.585	1.321	0.345

1. It includes 34.66 acres of cultivated land being under annual fallowing.

The Table XCV reveals that per capita share of the total land under cultivation is 1.266 acres which, owing to large fallowing in the kharif season, is reduced to 0.745 acre per head of population.[1] This amount further decreases to 0.585 acre per head in the rabi season due to large occupation of land by the continual kharif pulses (pigeon pea) during the rabi season and, in addition, to large fallowing, being 24.15 per cent of the total land under cultivation.

The actual amount of land which supports one person is the gross cultivated land, a sum total of both kharif and rabi sown areas. The per capita gross cultivated land amounts to 1.321 acres, while the per capita double cropped land is 0.345 acre.

In the whole population considered, the 95 per cent are the primary rural or cultivators; the rest are the secondary rural who depend upon the field produce of the former class through their ancillary services;they include tailor and carpenter-cum- ironsmith.

CALORIC INTAKE

The yields of the crops grown in the kharif and the rabi seasons are given in Table XCVI A. On the basis of yield rates of the crops, the total production of each of them in the village has been calculated and the total caloric consumption per head of population per day has, thereafter, been ascertained in Table XCVI B.

The rates of production in different quality lands are different. However,[2] the yield-rates given in the Table are each related to the land in which certain crop is mostly grown.

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1. The total population includes those persons also who live in adjacent villages but are exclusively dependent upon the produce of lands situated in this village.
2. The yield-rates enquired from the village-cultivators were reported in maunds which have been converted by the writer into kilograms.

Table XCVI A

Crops	Yield per acre (in kilograms)
Big millet (when sown with pulses)	95
Bulrush millet (when sown with pulses)	115
Pulses (pigeon pea) when sown with millets	86
Pulses (sown alone)	121
Rice (transplanted) unhusked	635
Rice (broadcast) unhusked	523
Small millet	150
Sweet potato	1,119
Wheat-gram (mixed)	308
Wheat-barley-peas (mixed)	295
Barley	261
Peas	336
Gram	299
Lentil	112

The good quality (A) lands are chief for rice, wheat-gram and peas. Most of the BI and BII quality lands are devoted to millets, pulses, mixed crops of wheat, barley and peas and lentil.

Table XCVI B gives the total yield of each food crop produced in the village in 1962-63. There is no import of any foodgrains from outside the village and the only import is that of sugar (gur) because sugarcane is not produced in this village. After the deduction of amounts of preserved seeds and export and after applying food— extraction rates, the total food available from each crop has been distributed to work out caloric intake per head per day. Thus, the total calories in the village amount to 2,057 per head per day, which signifies an adequate diet of the cultivators from the lands.

407

Table XCVI B

FOOD BALANCE SHEET

VILLAGE MOAZZAMNAGAR

(in kilograms)

Year 1962-63

...duction	Total Production	Export	Import	Available Supply	Seed	Food (Gross)	Extraction rate per cent	Food (net)	Per head Consumption Kilograms per year	Grams per day	Calori... per d...
4104.9	4104.9	615.7	-	3489.2	119.9	3369.3	95	3200.8	26.016	71.3	244.6
1207.5	1207.5	-	-	1207.5	29.4	1178.1	95	1119.2	9.099	24.9	86.7
2009.8 4070.4	6080.2	3040.0	-	3040.2	112.7	2927.5	95	2781.1	22.611	61.9	212.3
7340.6	7340.6	4893.7	-	2446.9	107.9	2339.0	66 2/3	1559.3	12.677	34.7	124.6
4100.3	4100.3	1366.7	-	2733.6	148.6	2585.0	66 2/3	1723.3	14.011	38.4	137.1
423.0	423.0	-	-	423.0	13.2	409.8	95	389.3	3.165	8.7	29.6
-	-	-	3321.0	3321.0	-	3321.0		3321.0	27.000	73.9	259.4
671.4	671.4	-	168.3	839.7	-	839.7	83	696.9	5.666	15.5	15.0
10416.6	10416.6	-	-	10416.6	1809.4	8607.2	92	7918.6	64.379	176.4	610.3
5718.7	5718.7	2859.0	-	2859.7	953.1	1906.6	95	1811.3	14.726	40.3	139.4
1671.4	1671.4	-	-	1671.4	301.9	1369.5	86 2/3	1186.9	9.649	26.4	91.2
499.5	499.5	-	-	499.5	24.9	474.6	95	450.9	3.666	10.0	34.6
568.1	568.1	-	-	568.1	104.5	463.6	95	440.4	3.580	9.8	35.1
309.8	309.8	-	-	309.8	57.0	252.8	85	214.9	1.747	4.8	16.2
253.7	253.7	-	-	253.7	46.4	207.3	82	169.9	1.381	3.8	12.9
156.6	156.6	-	-	156.6	31.2	125.4	70	87.8	0.714	1.9	6.3

The crop of wheat-gram (mixed) provides the largest calories to the average daily diet, being 610. The second in importance is sugar (gur). The third is big millet. Other crops are, in oder, pulses, peas, rice (broadcast) and rice (transplanted). Each of the remaining smaller crops like bulrush millet, lentil, gram and barley-peas-gram (mixed) provides less than 100 calories.

POTENTIAL PRODUCTION UNITS

On the basis of various yields of crops, the different types of cultivated and uncultivated lands in the village have been evaluated in accordance with their potential productivity. Table XCVII gives the relative ratings of various types of agricultural and unproductive lands;the total numbers of Potential Production Units have been inferred from ratings and acreage of each type of land.

Table XCVII

Average Yield per acre of Normal Standard Farmland in the Village: 337 kilograms or 1 P.P.U.

Type of land	Area in acres	Average yield in kilograms per acre	Productivity rating per acre	Number of P.P.U.
A	42.43	489	1.45	61.52
BI	77.63	337	1.00	77.63
BII	35.66	189	0.56	19.97
C	6.11	0	0	0
Total ...	161.83			159.12

The above Table shows that the total number of Potential Production Units is less than the total acreage of agricultural and waste lands of the village.

The BI quality lands possess the normal standard farmland, and this category of lands provides the largest number of P.P.U. to the total due to its largest acreage in the village being about half of the total land under plough.

The least area of the productive lands is the BII quality lands, 22.9 per cent. It has also the least productivity among agricultural lands, possessing 0.56 productivity rating per acre. And thus it contributes little to the total number of P.P.U.

The poor quality (C) lands, which are unproductive, have an area of 6.11 acres but do not provide any P.P.U. to the total number.

The extension of manuring and irrigation facilities in the village, particularly in rabi season may be greatly useful to improve potential productivity of the lands: a considerable proportion of BI lands can well be thus developed into A quality lands; similarly, the potential productivity of a considerable part of BII lands can be improved through the above measures.

The inadequate supply of compost or green manures to the cultivating lands and insufficient facilities of irrigation, especially on the occasion of a failure of summer monsoon rainfall and in the rabi season, result into low productivity; and the cultivator has to leave a large agricultural area under seasonal or annual fallowing, which shows a relatively low value of potential productivity of these lands.

CHAPTER IX

LAND UTILIZATION IN MUGARRA TATEI

LOCATION

The village Mugarra Tatei which lies in Tahsil Budaun is situated at $79^{\circ}1'30''$ E.long. and $27^{\circ}51'0''$ N.lat. (Fig.110). The area of the village is the Ganga khadar having a general slope from northwest to southeast. The texture of the soil is the sand mixed with fine silt.[1]

The village is bounded by villages Korha Shahpur and Kisol in the west, Sindrair and Kakmora Mahal Gang in the east, Kakora in the north, and Kahoni and Dharkakpur in the south. A large part of the village in the south and southeast has been eroded by the river Ganga. Besides, a small stream, coming from the west, falls into the river.

The village is about 3 kilometres southeast of the large village Qadar Chouk. At 2 kilometres north of this village, lies the famous village of Kakora which is the centre of Hindu religious gathering of annually held Ganga Ashnan fair. A brook also passes through the northeast corner of the village. Only cart-tracks connect the village with the villages lying in the west, north and east. The only good means of communication and transportation is an unmetalled road from Budaun to Qadar Chouk.

CLIMATE

There are no climatic data recorded in the village. The data of rainfall, however, are recorded at the headquarters of Budaun Tahsil which may be regarded as approximately the same for the village rainfall conditions. Tables XXIV and XXV give the rainfall data.

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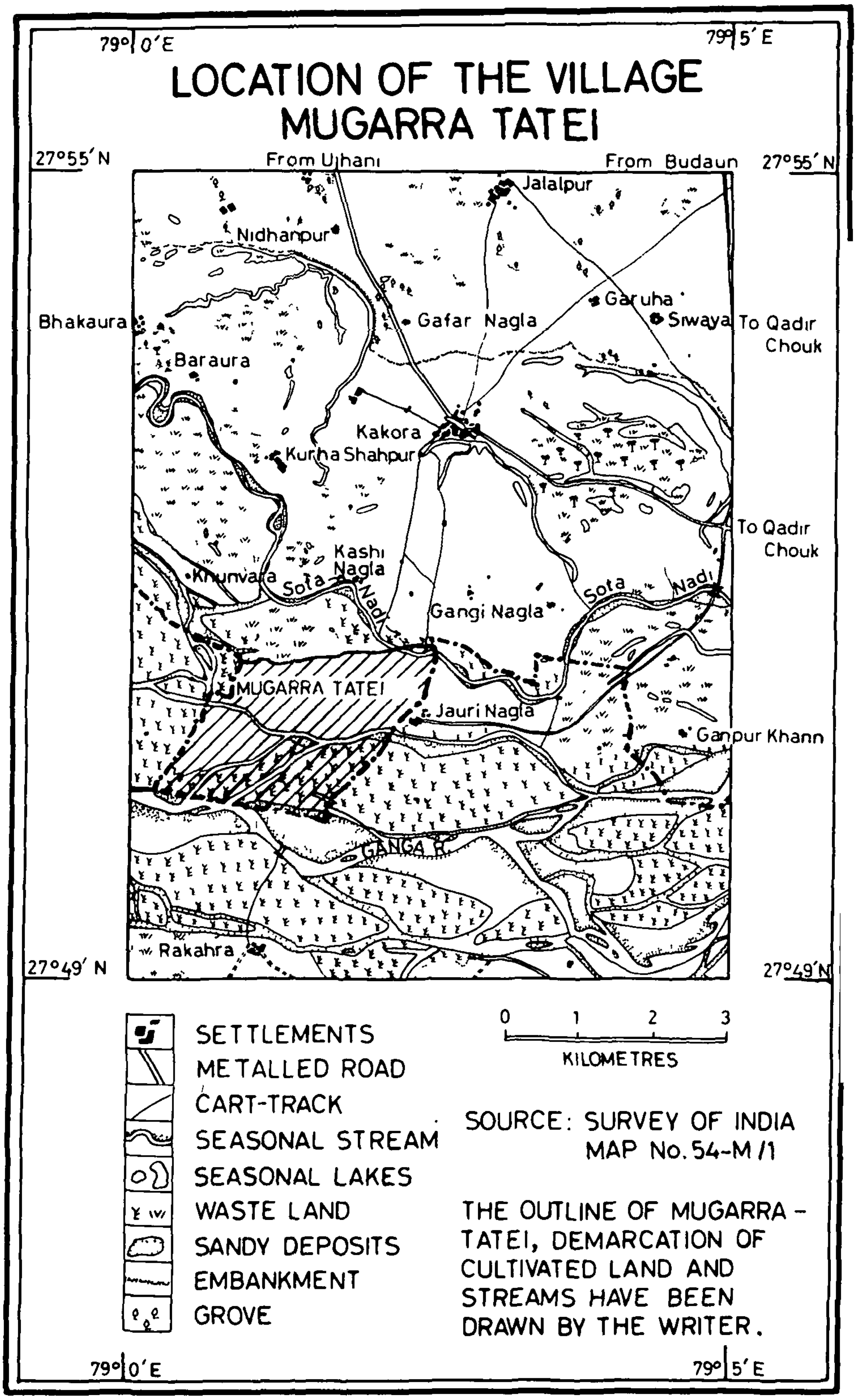
1. The fine and fertile silt deposited by the Ganga is locally known as '<u>parga</u>'.



79° 0′E
79° 5′E
LOCATION OF THE VILLAGE MUGARRA TATEI
27°55′N
From Ujhani
From Budaun
27°55′N
Jalalpur
Nidhanpur
Garuha
Siwaya
To Qadir Chouk
Bhakaura
Gafar Nagla
Baraura
Kakora
Kurha Shahpur
To Qadir Chouk
Kashi Nagla
Khunvara
Sota Nadi
Gangi Nagla
Sota Nadi
MUGARRA TATEI
Jauri Nagla
Ganpur Khann
GANGA R.
Rakahra
27°49′N
27°49′N
SETTLEMENTS
METALLED ROAD
CART-TRACK
SEASONAL STREAM
SEASONAL LAKES
WASTE LAND
SANDY DEPOSITS
EMBANKMENT
GROVE
0 1 2 3
KILOMETRES
SOURCE: SURVEY OF INDIA MAP No. 54-M/1
THE OUTLINE OF MUGARRA - TATEI, DEMARCATION OF CULTIVATED LAND AND STREAMS HAVE BEEN DRAWN BY THE WRITER.
79° 0′E
79° 5′E

FIG. 119

Table XXIV reveals that the kharif sowing period— June-July— received considerably less rainfall than the average. But the next two months of the season, August-September, received rainfall sufficiently more than average. The month of October was rainless. However, the total rainfall of the season was much greater than the average. The good rainfall in the growing period resulted in good cropping of the kharif crops.

Table XXV shows that the first two months of the rabi season of 1962-63, November-December, were rainless. It was January which received rainfall more than month's average. The month of February was also rainless and March also had a shortage of rainfall. The rainfall in the rabi season was much short being less than half of the season's average.

Besides the deficient rainfall in the rabi, the rabi crops have not suffered from it because the underground water-table remains high and the roots of crops receive moisture from under the ground, as the khadar soil is sandy and porous. It is why the irrigation is not generally needed for crops. Even the sugarcane crops is not irrigated.

LAND CLASSIFICATION

In accordance with the potential productivity of various lands of the village, the fields have been classified into A, B, and C quality lands (Fig.120).

The good quality (A) lands are those which produce either two crops in the kharif and the rabi seasons, known as the double cropped land, or produce sugarcane. The area of the good quality (A) lands is 504.844 acres or 50.6 per cent of the total land under cultivation. The porosity of the silted sandy soil is an asset to the agriculture here, especially in combination with the quite nearness of the underground water-table.[1] The A quality lands are generally found around the settlements.

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1. It is locally known as first class 'khadra.'

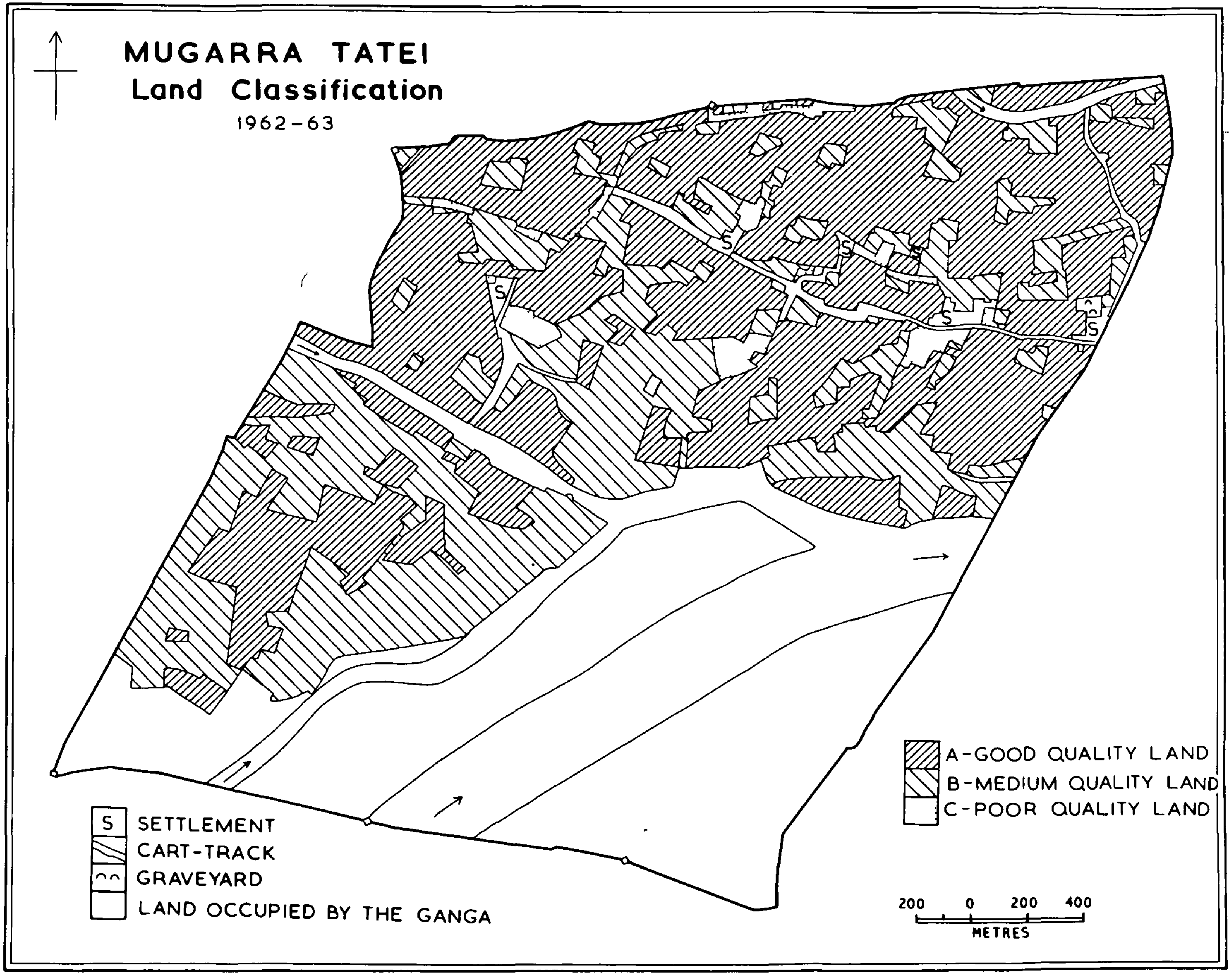
MUGARRA TATEI
Land Classification
1962-63
A-GOOD QUALITY LAND
B-MEDIUM QUALITY LAND
C-POOR QUALITY LAND
S SETTLEMENT
CART-TRACK
GRAVEYARD
LAND OCCUPIED BY THE GANGA
200 0 200 400
METRES
S

FIG. 120

The medium quality (B) khadar lands produce generally one crop during the year, in either the kharif or the rabi season. The B quality lands include those lands also which are occasionally put to fallow for more than one season. The area of the medium quality (B) lands is 493.062 acres or 49.4 per cent of the total land under cultivation.

Due to reasons of less amount of silt and less or no manuring to the soil, the B quality lands are lower in productivity than the good quality (A) lands. The poor quality (C) lands have no produce.

The good quality (A) lands are generally devoted to crops of vegetables,[1] rice (broadcast), maize, millets, sugarcane, wheat, wheat-barley (mixed) and barley. The medium quality (B) lands generally produce either the kharif crops of millets-with or without pulses (pigeon pea), groundnut sweet potato, or the rabi crops of barley, alone or mixed with either peas or wheat-peas.

IRRIGATION

Irrigation is not usually done in the village.

LAND UTILIZATION

The cultivated fields and lands under other uses, in the year 1962-63, have been shown in Fig.121. Table XCVIII gives the area of each use of land and its percentage to the total area of the village.

Table XCVIII shows that 59.42 per cent of the total area of the village is under cultivation and 36.77 per cent has been occupied by the river.[2]

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1. The land under vegetables is intensively cropped and is locally known as '<u>kachhiana</u>'; cultivators of vegetables are known as '<u>kachhi</u>'.
2. A checking up of agricultural holdings is done every year by the lekhpal— the village accountant of the Revenue Department, and the fields washed off by the Ganga are excluded from the records for that year; but on every fifth year the checking is finally done to remove or include the fields in the map and other records, this operation is termed as '<u>panjsala</u>' which means 5 year-course.

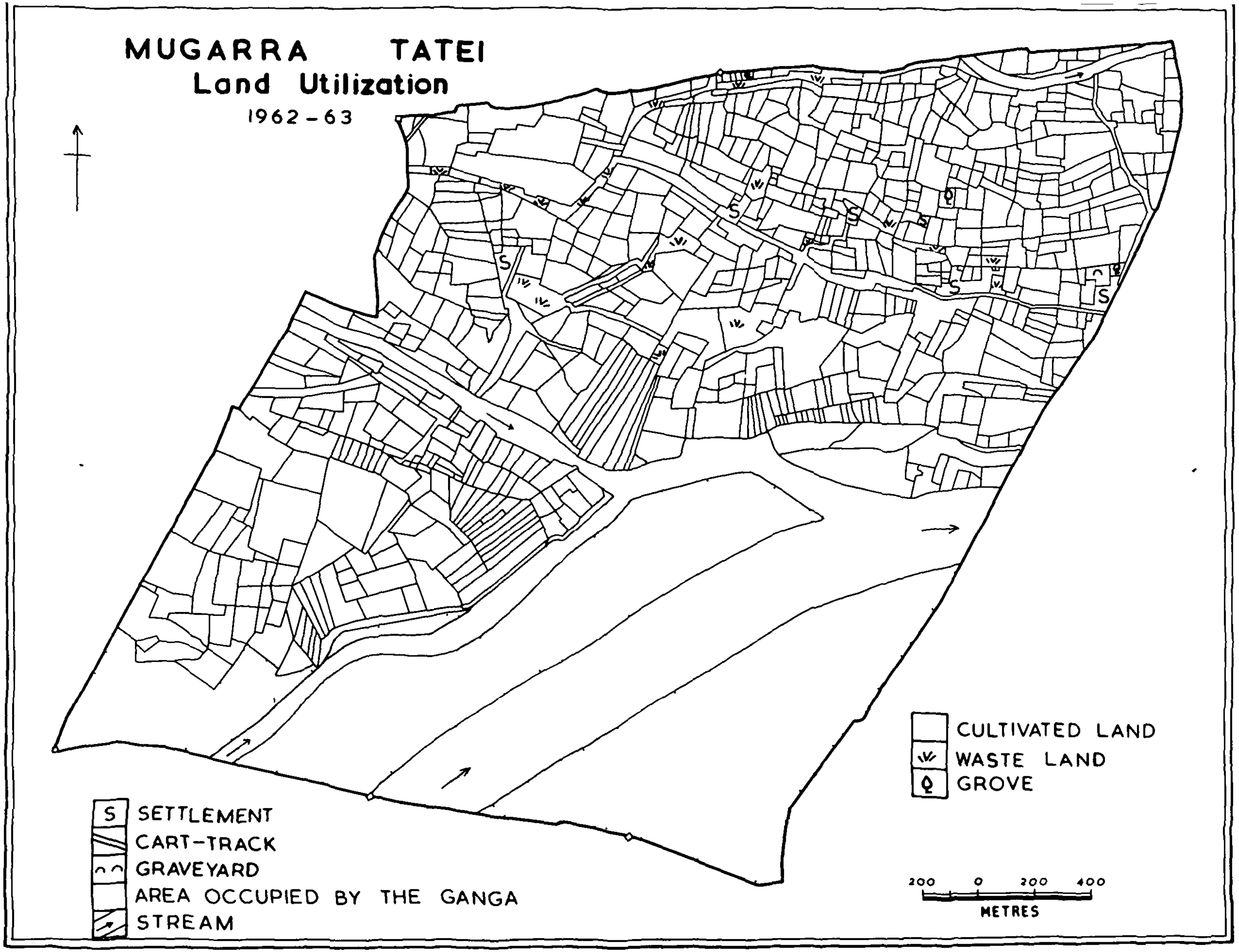
MUGARRA TATEI
Land Utilization
1962 - 63
S
SETTLEMENT
CART-TRACK
GRAVEYARD
AREA OCCUPIED BY THE GANGA
STREAM
CULTIVATED LAND
WASTE LAND
GROVE
200 0 200 400
METRES

FIG.121

Table XCVIII

Total area of the Village ... 1679.594 acres

Use of Land	Area in acres	Percentage to the total area
Cultivated land	997.906	59.42
Grove	9.000	0.54
Settlements	8.750	0.52
Cart-tracks	16.875	1.00
Waste land	27.970	1.66
Grave-yard	1.562	0.09
Land occupied by the river (Ganga)	617.531	36.77
Total ...	1679.594	100.00

The waste land occupies 27.970 acres or 1.66 per cent. The area under cart-tracks is 16.875 acres or 1 per cent, under groves: 9.0 acres or 0.54 per cent, under the graveyard: 1.562 acres or 0.09 per cent. There are six hamlets[1] of settlement in the village which have a total area of 8.750 acres or 0.52 per cent.

LAND UTILIZATION IN THE KHARIF SEASON

The lands occupied by various crops and other uses of land in the *kharif* season are depicted in Fig.122. The area occupied by each crop and its percentages to the total cultivated land and to the net cropped land are summarised in Table XCIX.

1. A hamlet is locally known as 'nagla'.

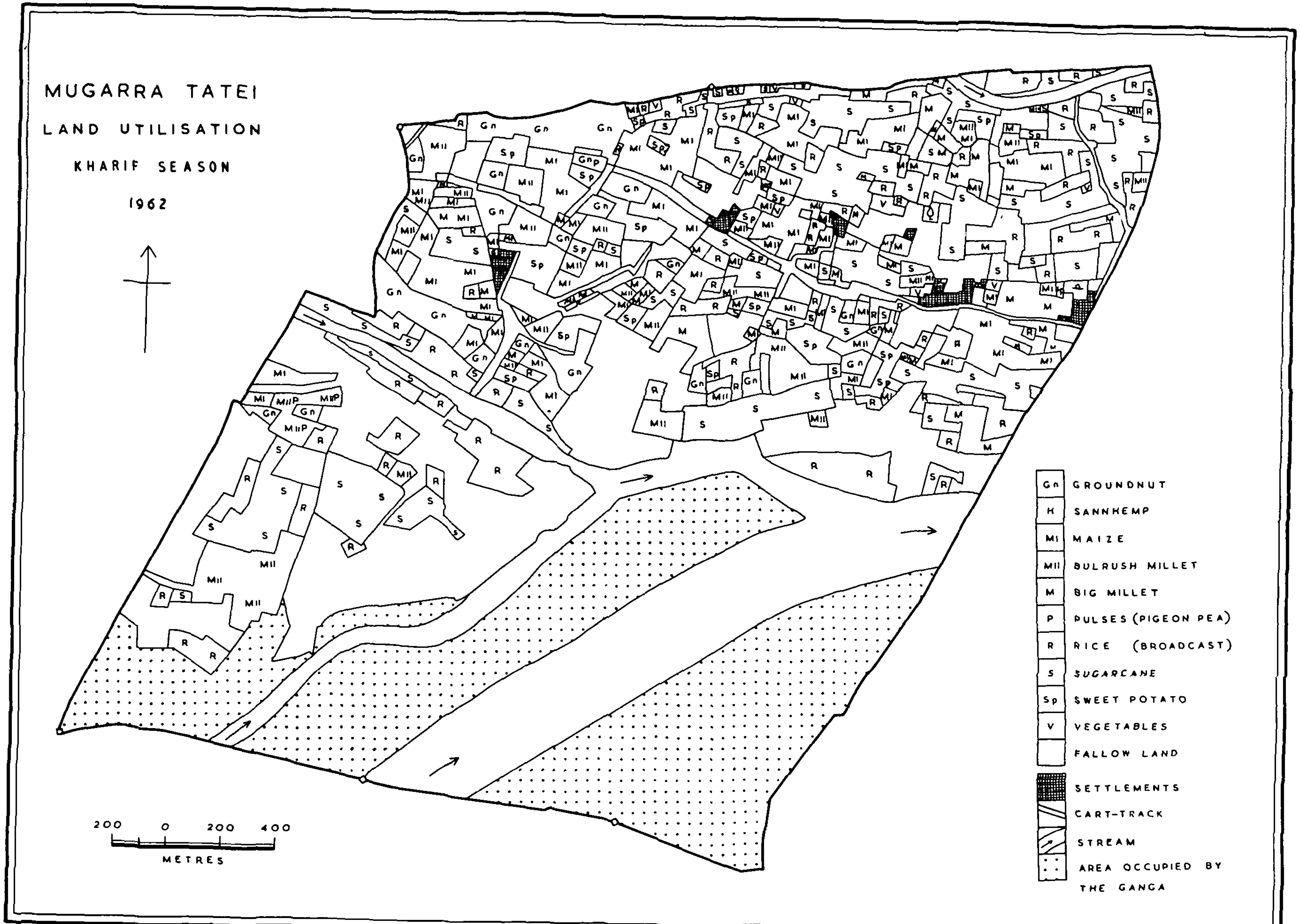
MUGARRA TATEI
LAND UTILISATION
KHARIF SEASON
1962
Gn GROUNDNUT
H SANNHEMP
Ml MAIZE
Mll BULRUSH MILLET
M BIG MILLET
P PULSES (PIGEON PEA)
R RICE (BROADCAST)
S SUGARCANE
Sp SWEET POTATO
V VEGETABLES
FALLOW LAND
SETTLEMENTS
CART-TRACK
STREAM
AREA OCCUPIED BY THE GANGA
200 0 200 400
METRES

FIG.122

Table XCIX

Total Cultivated Land ... 997.906 acres

Net Cropped Land in the Kharif Season ... 607.875 acres

Crops	Area in acres	Percentage to the cultivated land	Percentage to the net cropped land	Total percentage to the cultivated land	Total percentage to the net cropped land
Grain Crops				36.49	59.87
Rice (broadcast)	129.875	13.01	21.35		
Maize	125.781	12.61	20.68		
Bulrush millet	61.844	6.19	10.15		
Big millet	41.062	4.11	6.75		
Bulrush millet and pulses	5.656	0.57	0.94		
Other Crops				24.42	40.13
Sugarcane	138.594	13.88	22.80		
Groundnut	64.531	6.47	10.64		
Sweet potato	38.688	3.88	6.37		
Vegetables	1.844	0.19	0.32		
Fallow	390.031	39.09		39.09	
Total ...	997.906	100.00	100.00	100.00	100.00

The Table XCIX shows that 36.49 per cent of the total area under cultivation is under grain crops and 24.42 per cent under non-cereal crops. On the other hand, 390.031 acres or 39.09 perc cent of the total land under plough is put to fallow denoting shortage of fertility. Out of the net cropped land in the kharif season, the 59.87 per cent is under grain crops and 40.13 per cent under the non-cereal crops.

Among the grain crops, rice (21.35 per cent) and maize (20.68 per cent) are the major crops, while bulrush millet and big millet are comparatively the smaller crops, and pulses (pigeon pea) sown with bulrush millet is the smallest crop.

Among non-cereal crops, sugarcane[1] is the largest crop, being 138.594 acres or 22.8 per cent of the net cropped land. Groundnut and sweet potato possess 10.64 per cent and 6.37 per cent but the vegetables occupy the least area, 1.844 acres. It is remarkable that transplanted rice is not grown in the village at all.

LAND UTILIZATION IN THE RABI SEASON

The distribution of crops grown in the rabi season, 1962-63, and other uses of land are shown in Fig.123. A summary of the area under each rabi crop and its percentages to the total land under cultivation and to the net cropped land is given in Table C.

The Table C shows that (57.20+ 2.25) or 59.45 per cent of the total land under cultivation has been cropped in the rabi season. Out of the net cropped land, 96.22 per cent is under grain crops and 3.78 per cent under vegetables.

Among grain crops, wheat occupies the largest percentage of the net cropped area (36.6). Other large crops are wheat-barley (mixed) and barley, being 29.94 per cent and 27.40 per cent. The mixed crops of peas-barley and peas-wheat-barley occupy small areas.

It is remarkable that gram is not grown in the village. Only vegetables are grown in the non-cereal cropping. A very large part of the cultivated land is under fallowing during the season, being 26.1 per cent of the total

---

1. Sugarcane crop is locally known as '<u>Ookh</u>'.

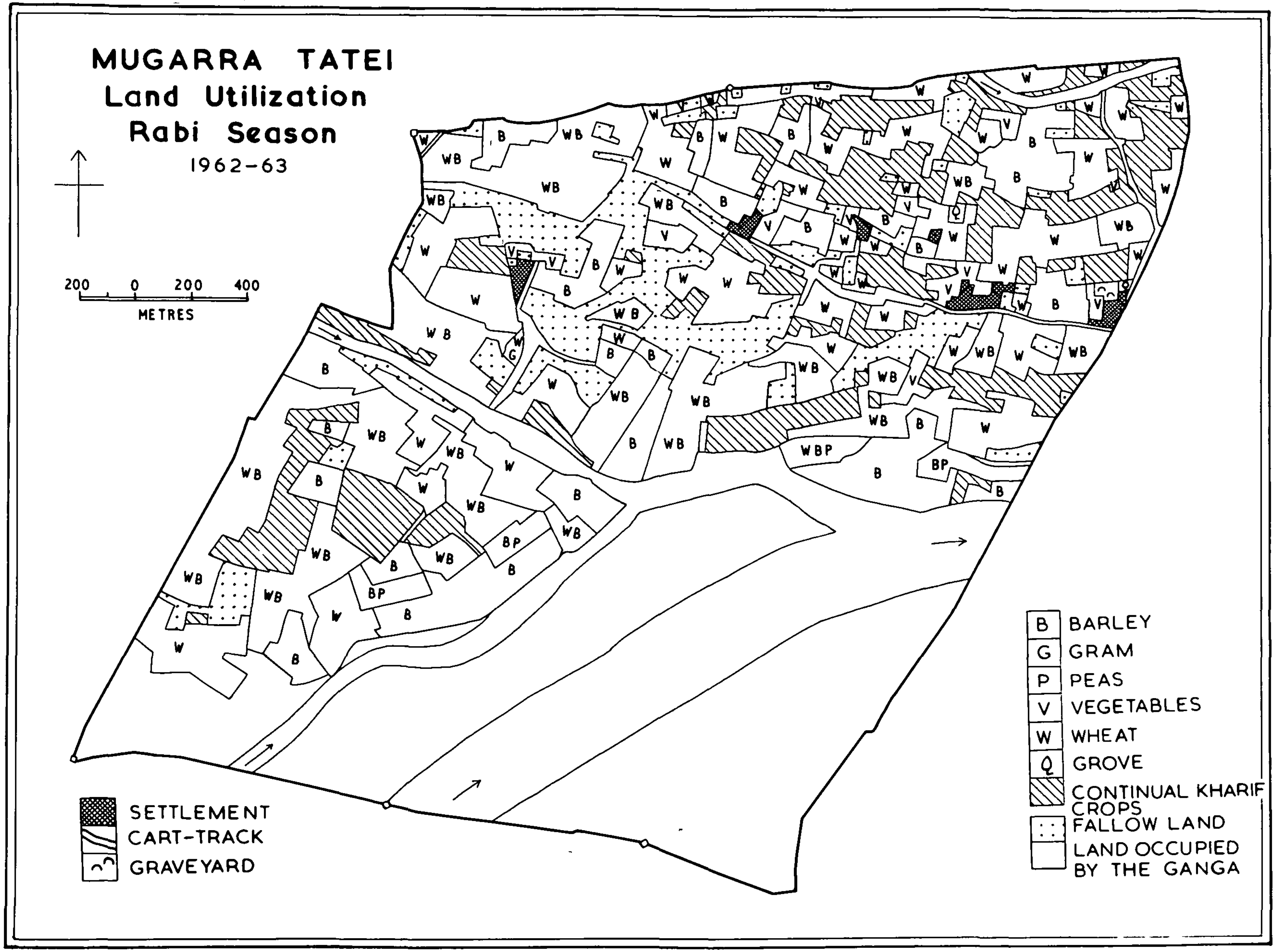
MUGARRA TATEI
Land Utilization
Rabi Season
1962-63
200 0 200 400
METRES
B BARLEY
G GRAM
P PEAS
V VEGETABLES
W WHEAT
GROVE
CONTINUAL KHARIF CROPS
FALLOW LAND
LAND OCCUPIED BY THE GANGA
SETTLEMENT
CART-TRACK
GRAVEYARD

FIG.123

Table C

Total Cultivated Land ... 997.906 acres

Net Cropped Land in the Rabi Season ... 593.188 acres

Crops	Area in acres	Percentage to the total cultivated land	Percentage to the net cropped land	Total percentage to the total cultivated land	Total percentage to the net cropped land
<u>Grain Crops</u>				57.20	96.22
Wheat	216.813	21.73	36.60		
Wheat-barley (mixed)	177.594	17.80	29.94		
Barley	162.750	16.31	27.40		
Peas-barley (mixed)	12.656	1.27	2.13		
Peas-wheat-barley(mixed)	0.906	0.09	0.15		
<u>Other Crops</u>				2.25	3.78
Vegetables	22.469	2.25	3.78		
<u>Fallow</u>	260.468	26.10		26.10	
<u>Continual Kharif Crops</u>	144.250	14.45		14.45	
Total ...	997.906	100.00	100.00	100.00	100.00

cultivated land which denotes want of fertility in a huge amount of cultivated land which is medium quality land.

The continual kharif crops, occupying the soil in the rabi, include sugarcane and pulses (pigeon pea).[1] They have a total percentage of 14.45 of the total land under plough.

1. The pigeon pea is locally called '<u>harera</u>' or '<u>arhar</u>', or '<u>harra</u>'.

DOUBLE CROPPED LAND

The area which is cropped twice in the kharif as well as in the rabi seasons is shown in Fig.124. It has an area of 366.250 acres or 36.8 per cent of the total cultivated land of the village. All the double cropped area possesses good quality (A) lands. The per capita double cropped land amounts to 0.623 acre only.

ROTATION OF CROPS

In accordance with the character of the soil in relation to changes in deposition or erosion of fine fertile silt, underground water-table, climatic changes, extent of manuring applied to the land and finally needs of the cultivators, certain rotations of crops are kept on. The good quality (A) lands are usefully cropped in successive seasons for years. The rotation usually practised is as follows:

Crop year	Kharif Season	Rabi Season
First Year	Sugarcane/Rice (broadcast)/ vegetables	Sugarcane (contd.)/wheat/ vegetables
Second Year	Maize/sugarcane (contd.)	Wheat/wheat-barley/sugarcane
Third Year	Millets/maize	Barley/wheat-barley/peas-barley

The rotation in the medium quality (B) lands is as follows:

Crop Year	Crop in either kharif season	or	in Rabi season
First Year	Maize/millets/millets and pulses	or	Wheat/wheat-barley (mixed)
Second Year	Millets/groundnut		Wheat-barley (mixed)/barley
Third Year	Groundnut/sweet potato		Barley/peas-barley (mixed)

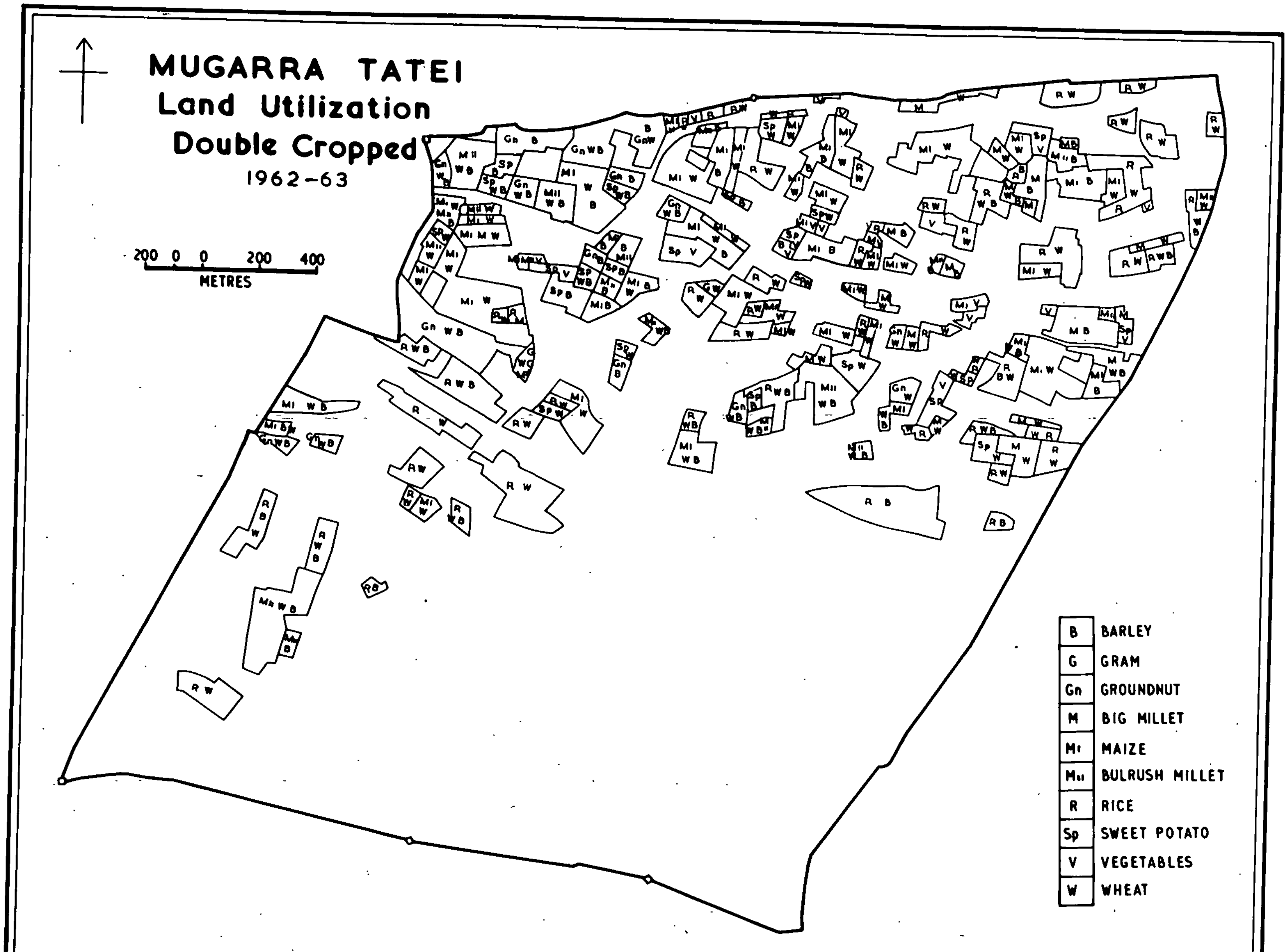
MUGARRA TATEI
Land Utilization
Double Cropped
1962-63
200 0 0 200 400
METRES
B BARLEY
G GRAM
Gn GROUNDNUT
M BIG MILLET
Mi MAIZE
Mii BULRUSH MILLET
R RICE
Sp SWEET POTATO
V VEGETABLES
W WHEAT

FIG.124

The medium quality (B) lands are cropped in either the kharif season or the rabi season and are left fallow for the other season. A part of the medium quality lands may occasionally be put to fallowing for more than one season for recuperation of fertility.

LAND USE AND POPULATION

The total population dependant upon the produce of this village is 588 which includes also the persons who live in other villages of Jorhi Nagla, Korha Shahpur and Kisol but cultivate in Mugarra Tatei and depend upon its produce. Table CI gives the total cultivated land, net cropped land in the kharif and rabi seasons, gross cultivated land and double cropped land alongwith per capita share in each of them.

Table CI

Total Population, Village Mugarra Tatei ... 588

(Area in acres)

	Total area of the village	Total land under cultivation [1]	Net cropped land in the kharif season	Net cropped land in the rabi season	Gross cultivated land (both kharif and rabi)	Double cropped land
	1679.594	997.906	607.875	593.188	1201.063	366.250
Land per head of population	2.856	1.697	1.034	1.009	2.043	0.623

The Table shows that per capita land available for cultivation is 1.697 acres which, owing to large fallowing in the kharif season, becomes 1.034 acres per head. The net cropped land in the rabi season further decreases to 1.009 acres per head due to fallowing in the rabi season and the large

1. **The cultivated land includes 163.093 acres which remained under fallowing throughout the year.**

area occupied in rabi by the continual kharif crops (141.250 acres or 14.45 per cent of the total land under cultivation).

The gross cultivated land of both kharif and rabi seasons amounts to 2.043 acres per head of population. The actual amount of land which supported one person in the village Kurarra Tatei is thus 2.043 acres. On the other hand, the double cropped land amounts only to 0.623 acre per head.

Out of the total population, 94 per cent are primary rural or cultivators, and the rest are secondary rural who are dependent upon the produce of the former class through their subsidiary services like potters, tailors, carpenter-cum-blacksmith and shopkeeper.

CALORIC INTAKE

The yield rates of various crops grown in the kharif and the rabi seasons in the village are given in Table CII A.

Table CII A

Crops	Yield per acre (in kilograms)
Rice (broadcast, unhusked)	376
Maize	269
Bulrush millet (sown alone)	187
Big millet (sown alone)	137
Bulrush millet (when sown with pulses)	36
Pulses (when sown with millets)	85
Canesugar (gur)	783
Sweet potato	1,866
Wheat	356
Barley	340
Peas-barley (mixed)	371
Peas-wheat-barley (mixed)	362
Potato	1,866

On the basis of yield rates the total productions of various crops in the village have been calculated and therefrom the total caloric consumption per head per day has been inferred in Table CII B.

The yield rate of a crop differs considerably from one soil type to another. However, the yield-rates of crops grown in the good quality (A) lands are highest as these lands possess highest potential productivity.

Table CII B. shows the total yields of each crop produced in the village. After the deduction of exports[1] and preserved seeds the total available foodstuff of each crop has been worked out and after applying extraction rates, the total available food has been distributed to ascertain per head per day consumption. Thus the calories have been inferred from above which total to 1065 calories per head per day; it denotes a state of under-nutrition in the village.

The large calorific supply of food is from wheat 376, wheat-barley (mixed), maize, barley, sweet potato, rice (broadcast), sugar (gur), bulrush-millet and big millet.

POTENTIAL PRODUCTION UNIT

The different types of productive and unproductive lands have been assessed to ascertain potential productivity of each of them on the basis of fertility and productivity. Table CIII gives the relative ratings of different types of lands and the total number of Potential Production Units of each of them.

It will be seen from the Table that the total number of Potential Production Units is greater than the total of good quality, medium quality and poor quality lands. The good quality (A) lands are equal to 1.35 P.P.U. per acre which result in large contribution to the total number of P.P.U. of the village.

---

1. Most of the export of cereals goes to village Kahora and gur (sugar) goes to Ujhari, one of the biggest commercial centres of the district.

Table CII B

FOOD BALANCE SHEET

VILLAGE MUGARRA TATEI

(in kilograms)

Population ... 588

Year 1962-63

Commodity	Production	Total Production	Export	Import	Available Supply	Seed	Feed (Gross)	Extraction rate per cent	Feed (net)	Per head Consumption: Kilograms per year	Per head Consumption: Grams per day	Per head Consumption: Calories per day
Rice (broadcast)	48443.4	48443.4	29065.0	-	19378.4	3635.2	15743.2	66 2/3	10495.5	17.849	48.9	174.6
Maize	37608.5	37608.5	16477.3	-	16477.3	1173.6	15303.7	89	13620.3	23.164	63.5	226.1
Bulrush millet	11564.8)	12198.3	1219.8	-	10978.5	362.2	10616.3	95	10085.5	17.152	46.9	163.2
Bulrush millet (sown with pulses)	633.5)											
Big millet	7678.6	7678.6	767.9	-	6910.7	233.1	6677.6	95	6343.7	10.789	29.6	101.5
Pulses (sown with millets)	475.1	475.1	-	-	475.1	4.7	470.4	95	446.9	0.760	2.1	7.2
Sugar (gur)	108519.1	108519.1	85391.0	-	23128.1	12932.2	10195.9		10195.9	17.339	47.5	166.7
Sweet potato	72191.8	72191.8	20210.6	-	51981.2	-	51981.2	83	43144.4	73.375	201.0	194.9
Wheat	72849.2	72849.2	36424.6	-	36424.6	9539.8	26884.8	90	24196.3	41.150	112.7	376.4
Wheat-barley	60026.8	60026.8	30013.4	-	30013.4	7814.1	22199.3	80	17759.4	30.203	82.7	275.4
Barley	55335.0	55335.0	27667.0	-	27668.0	7161.0	20507.0	70	14354.9	24.413	66.9	222.1
Peas-barley	4695.4	4695.4	-	-	4695.4	607.4	4088.0	82	3352.2	5.701	15.6	52.9
Peas-wheat-barley	327.9	327.9	-	-	327.9	41.7	286.2	85	243.3	0.414	1.1	3.7
Total												1964.7

Table XIII

Average Yield per acre of Normal Standard Farmland in the Village: 299 kilograms or 1 P.P.U.

Type of land	Area in acres	Average yield in kilograms per acre	Productivity rating per acre	Number of P.P.U.
Good quality (A) lands	504.844	405	1.35	681.539
Medium quality (B) lands	493.062	299	1.00	493.062
Poor quality (C) lands	27.970	0	0	0
Total ...	1,025.876			1,174.601

The medium quality (B) lands possess the normal standard productivity and are equal to 1 P.P.U. per acre. The poor quality (C) lands have neither any crop production nor provide any P.P.U. to the total. But these lands are comparatively less in area.

If the fine fertile silt, brought and deposited by the river Ganga, is well extended to the medium quality (B) lands and/or the manuring is done at times, the productivity of the B quality lands may considerably be raised to that of A quality lands. This is subject to the favourable deposition of silt by the river as the river's adverse action of removing off the fertile layer of upper soil and / or depositing the coarse sand on the land mars the value of the land and renders the land unproductive. In other lands the manuring and other agricultural operations are subject to the favourable action of the river.

LAND UTILIZATION IN GUTETI UTTAR

Location

The village Guteti Uttar, lying in the Tahsil Jalalabad, is situated at 79° 30' 45" E. long. and 27° 36' 25" N. Lat. (Fig.125) The village lies in the Ganga Khadar tract. The general slope of the area is from northwest to southeast. The soil is texturally sandy with an admixture of fine silt brought and deposited by the river Ganga.

The villages on its boundaries are Bharatpur in the west, Sharifpur in the east, Pirthipur Dhai in the north, and Guteti Mahal South (district Farrukhabad) in the south which shows that Guteti Uttar is the last southern village in the Ganga Khadar area of the district Shahjahanpur.

The Ganga has eroded the southern part of the village. The land is either enriched with the silt deposited by the river or is rendered useless with the erosion of silt and deposition of coarse infertile sand on the land. A small seasonal brook divides the length of the village following in a direction from southwest to northeast and to the east.

As regards the means of communications and transport, there is an unmetalled road from northeast (Jalalabad) to sourthwest (Ganga). Besides it, several cart-tracks go from this village to the surrounding villages.

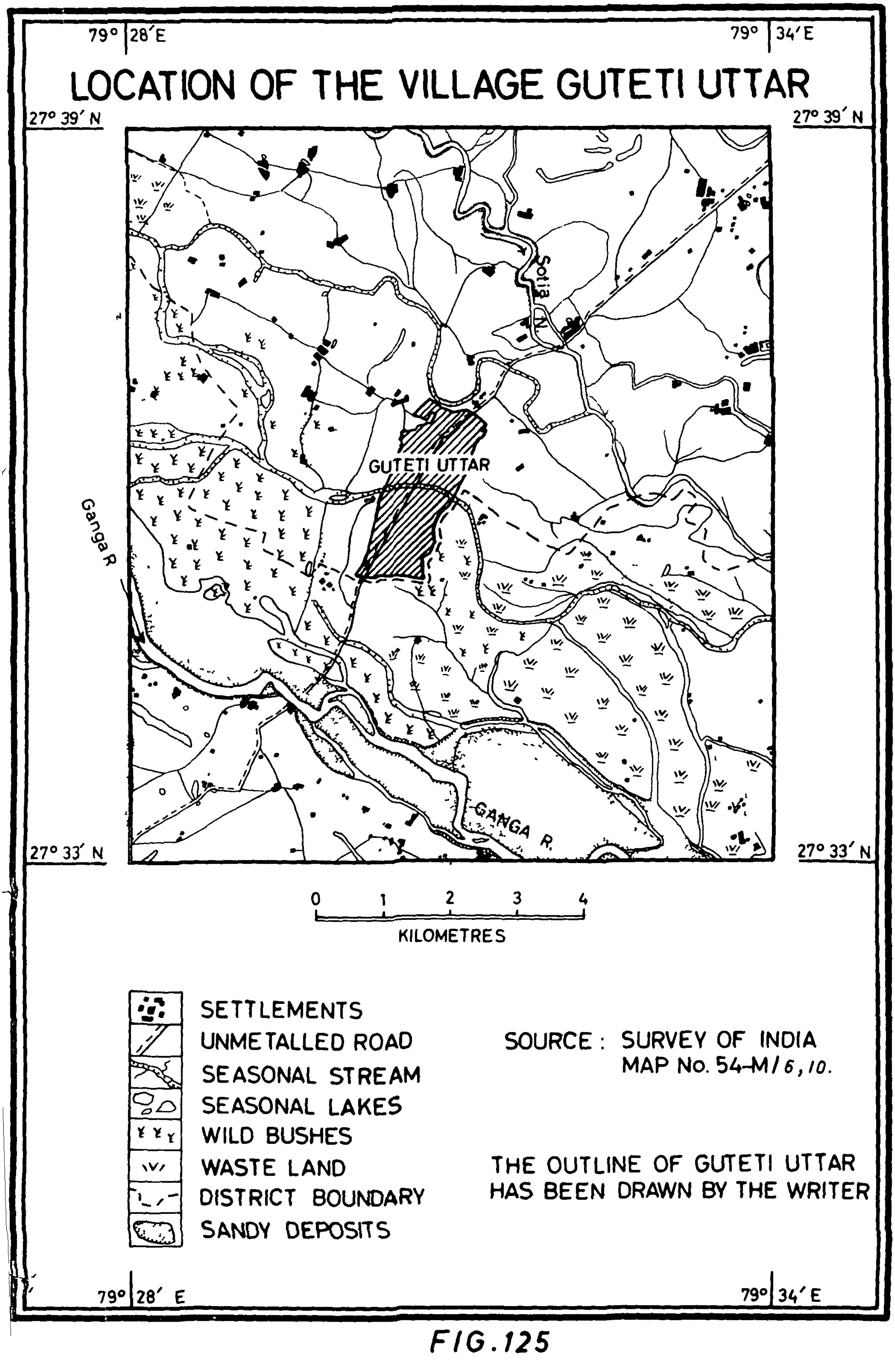
79° 28′E
79° 34′E
LOCATION OF THE VILLAGE GUTETI UTTAR
27° 39′ N
27° 39′ N
Sota N.
GUTETI UTTAR
Ganga R
GANGA R.
27° 33′ N
27° 33′ N
0 1 2 3 4
KILOMETRES
SETTLEMENTS
UNMETALLED ROAD
SEASONAL STREAM
SEASONAL LAKES
WILD BUSHES
WASTE LAND
DISTRICT BOUNDARY
SANDY DEPOSITS
SOURCE : SURVEY OF INDIA
MAP No. 54-M/6,10.
THE OUTLINE OF GUTETI UTTAR
HAS BEEN DRAWN BY THE WRITER
79° 28′ E
79° 34′ E

FIG.125

CLIMATE

No climatic data are recorded for the village. The data of rainfall, however, recorded at the headquarters of Tahsil Jalalabad, are available which may be considered the same as the rainfall conditions of the village. Tables C IV and C V have given the rainfall data.

TABLE C IV

Kharif Season, 1962 (Jalalabad)

	MONTHS					
	June	July	Aug.	Sept.	Oct.	Total
Rainfall in millimetres in the kharif season, 1962.	39.4	151.2	398.5	197.1	--	786.2
Rainy days in kharif, 1962	3	7	16	5	--	
Average rainfall in millimetres	82.6	259.2	272.6	151.7	53.3	819.4

The above Table shows scanty rainfall[1] in June and July; yet August and September received much more than the monthly averages. October was rainless. The seasonal total rainfall was less than the average.

TABLE C V

Rabi season, 1962-63 (Jalalabad)

	MONTHS					
	Nov.	Dec.	Jan.	Feb.	March	Total
Rainfall in millimetres in the rabi season, 1962-63	--	--	19.1	--	4.9	24.(
Rainy days in rabi, 1962-63	--	--	2	--	2	
Average rainfall in millimetres.	1.9	5.8	16.4	17.4	12.0	53.5

1. A local adage says :'Kariya badal ji darpawe-Bhura badal pani lawe' which means that a black cloud is awful and a grey cloud brings rainfa

The above Table shows that November & December were rainless. It was only Janaury which received a sufficiently good rainfall; but it was followed by a dry month of February, and March got less than half of the month's average. As a result, the whole rabi season received less than half the seasonal average rainfall.

However, the crops of rabi have not suffered from it. The high table of the underground water plays an important role to provide needed moisture to the rabi crops and the porosity of the cropped sandy soil of khadar is very useful. It is why the irrigation is not usually in operation in the village, even to the crops of sugarcane.

LAND CLASSIFICATION

According to the fertility and productivity of various types of lands, a classification of fields has been worked out into the good quality, medium quality and poor quality lands marked as A, B and C respectively (Fig. 126).

The double cropped areas and the lands under sugarcane cultivation are classed as good quality (A) lands. The area of A quality lands is 223.85 acres which is 40.8 % of the total land under cultivation in the village. The fields around the settlement sites are best manured fields[1] and are also included in the A quality lands.

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1. Most of the usual manuring is through the daily application of human faeces.

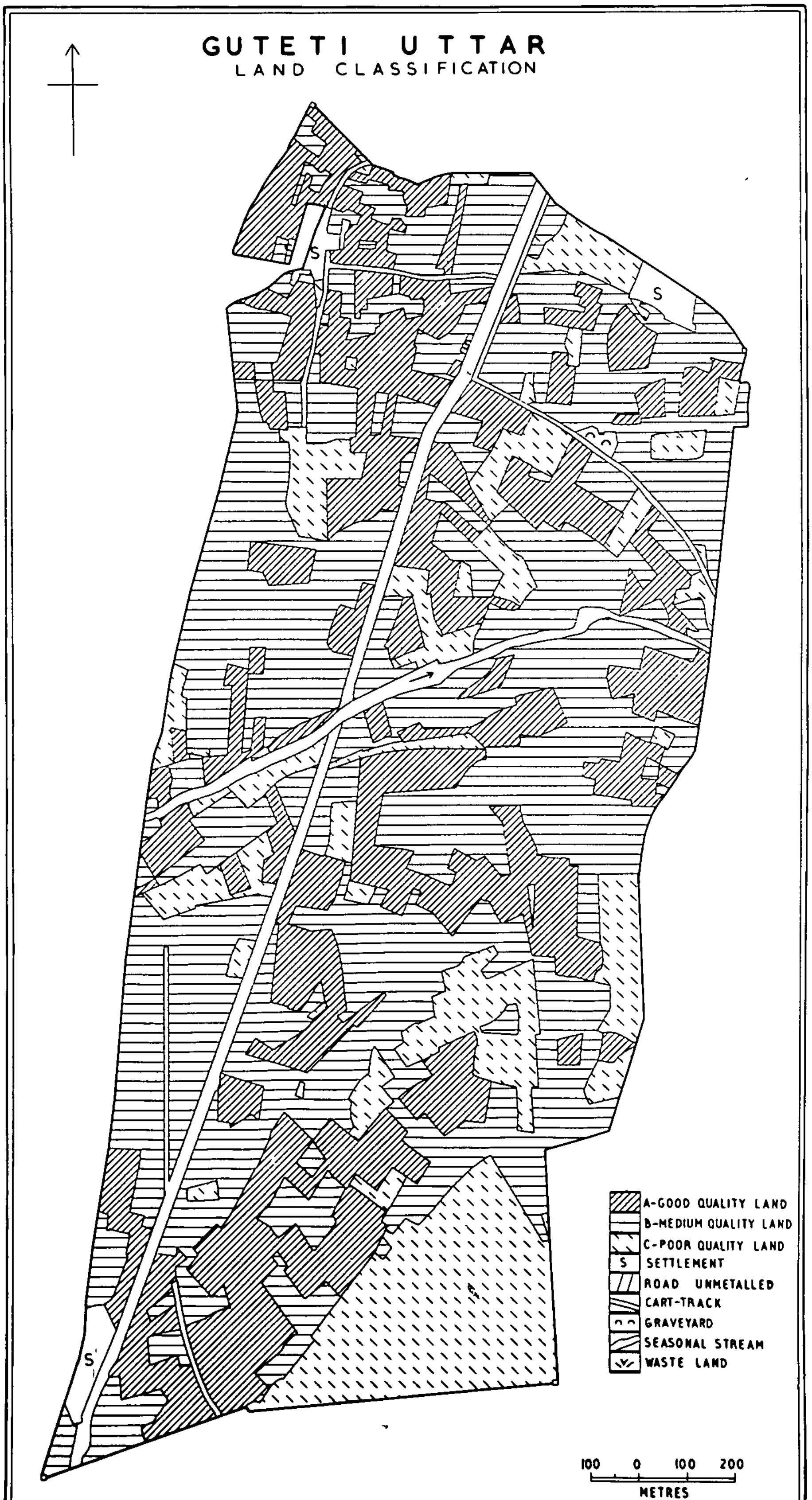

GUTETI UTTAR
LAND CLASSIFICATION
S
S
S
A-GOOD QUALITY LAND
B-MEDIUM QUALITY LAND
C-POOR QUALITY LAND
S SETTLEMENT
ROAD UNMETALLED
CART-TRACK
GRAVEYARD
SEASONAL STREAM
WASTE LAND
100 0 100 200
METRES

FIG.126

The medium quality (B) lands are those which produce only one crop during the year, in either the kharif or the rabi season. These lands are left fallow for the other season. This type of land includes the lands also which are occasionally left fallow for two seasons. The area of the B quality lands is 325.00 acres or 59.2 % of the total land under plough in the village.

The crops generally grown in the A quality lands are rice, maize, bulrush millet, big millet, wheat, barley, barley-gram-peas (mixed) and sugarcane.

The crops usually grown in the B quality lands are millets-- with or without pulses (pigeon pea), -- maize, sweet potato, peas, lentil, fodder, potato and barley mixed with peas or gram or both.

IRRIGATION

No irrigation is operated in the kharif season; but some of the crops are irrigated during rabi season (Fig. 127). The irrigated crops are usually wheat, peas and potato.

LAND UTILIZATION

The fields under cultivation and lands under other uses in the year 1962-63 have been shown in Fig. 128. The area occupied by each use of land and its percentage to the total area of the village are given in Table C VI.

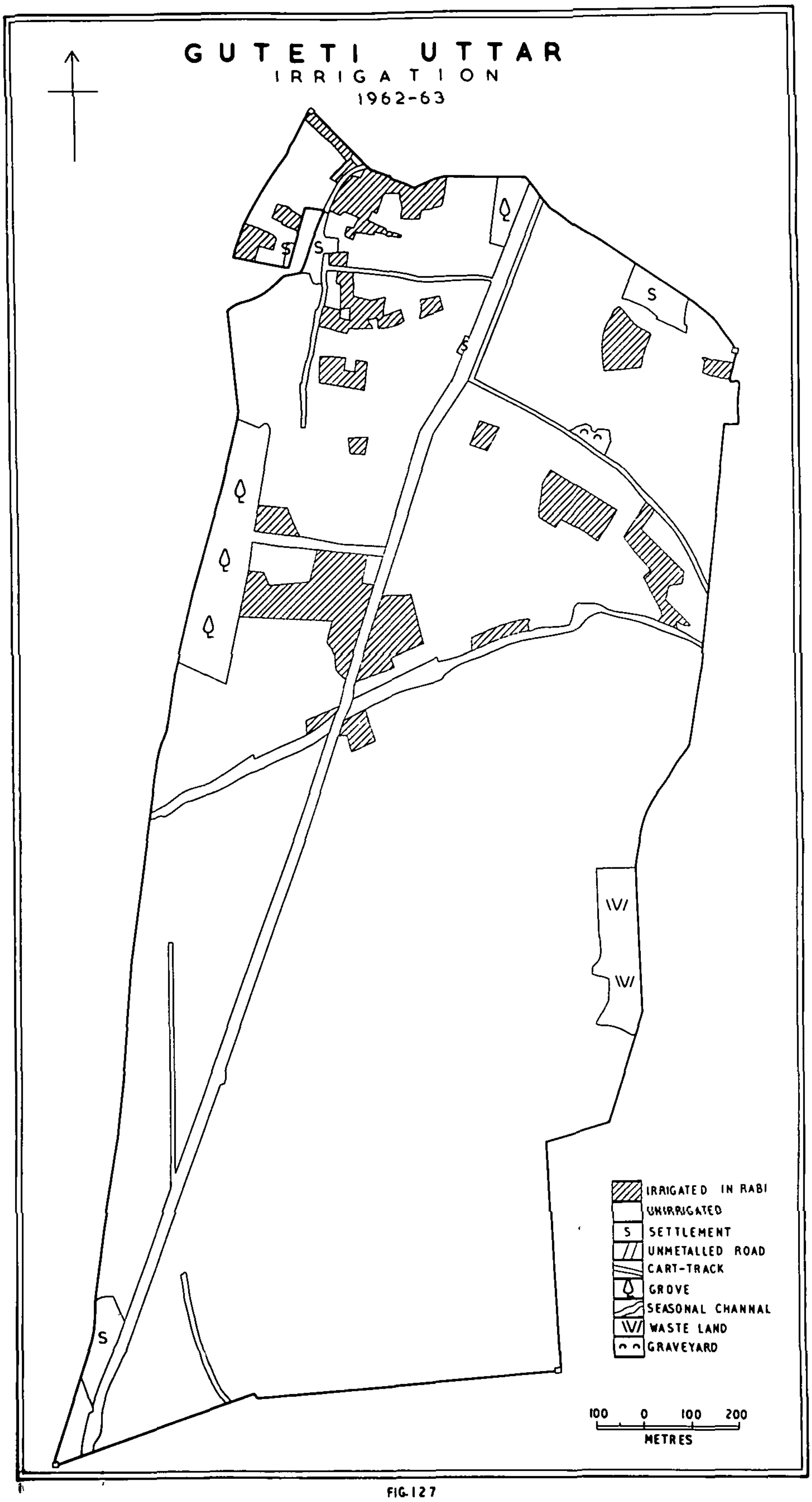

GUTETI UTTAR
IRRIGATION
1962-63
S
S
S
S
IRRIGATED IN RABI
UNIRRIGATED
SETTLEMENT
UNMETALLED ROAD
CART-TRACK
GROVE
SEASONAL CHANNAL
WASTE LAND
GRAVEYARD
100 0 100 200
METRES

FIG. 127

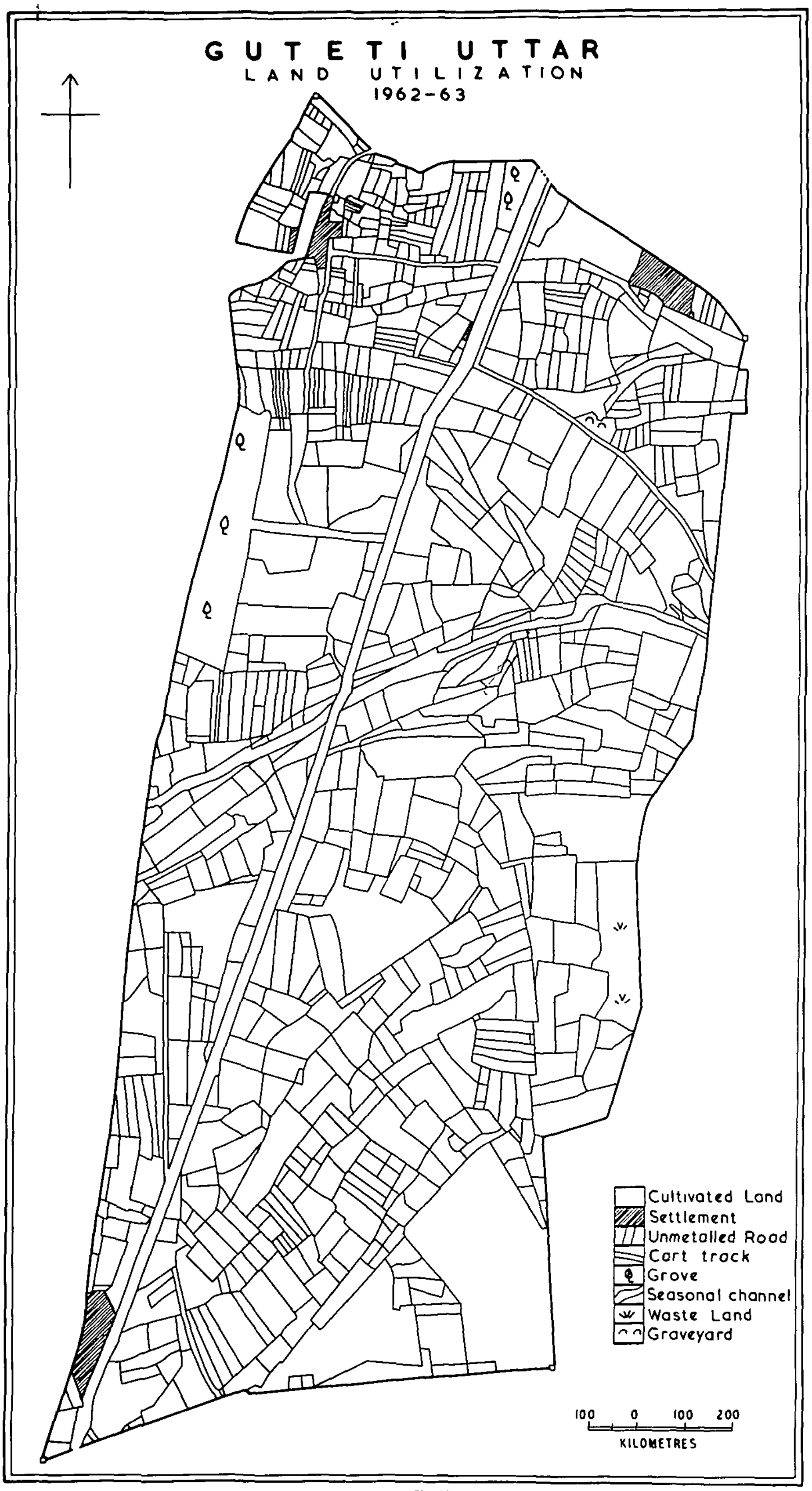

GUTETI UTTAR
LAND UTILIZATION
1962-63
Cultivated Land
Settlement
Unmetalled Road
Cart track
Grove
Seasonal channel
Waste Land
Graveyard
100 0 100 200
KILOMETRES

FIG 128

TABLE C VI

Total area of the village : 650.42 acres

Use of land	Area in acres	Percentage to the total area
Cultivated land	548.85	84.38
Grove	12.79	1.97
Settlement	5.92	0.91
Cart-track	4.72	o.73
Road (un-metalled)	15.63	2.40
Waste land	57.37	8.82
Cemetery	0.74	0.11
Occupied by seasonal streams	4.40	0.68
Total	650.42	100.00

It will be seen from the above Table that 84.38% of the total area of the village is under cultivation, while 8.82% is waste land. Only 1.97 % is under groves. The 2.4 % of the land is under road and 0.73 % under cart-tracks. An area of 5.92 acres or 0.91 % is under the settlements of the village, which consists of 5 hamlets.

LAND UTILIZATION IN THE KHARIF SEASON

The fields under various crops and fallowing and other uses of land in the kharif season, 1962, are shown in Fig. 129. A summary

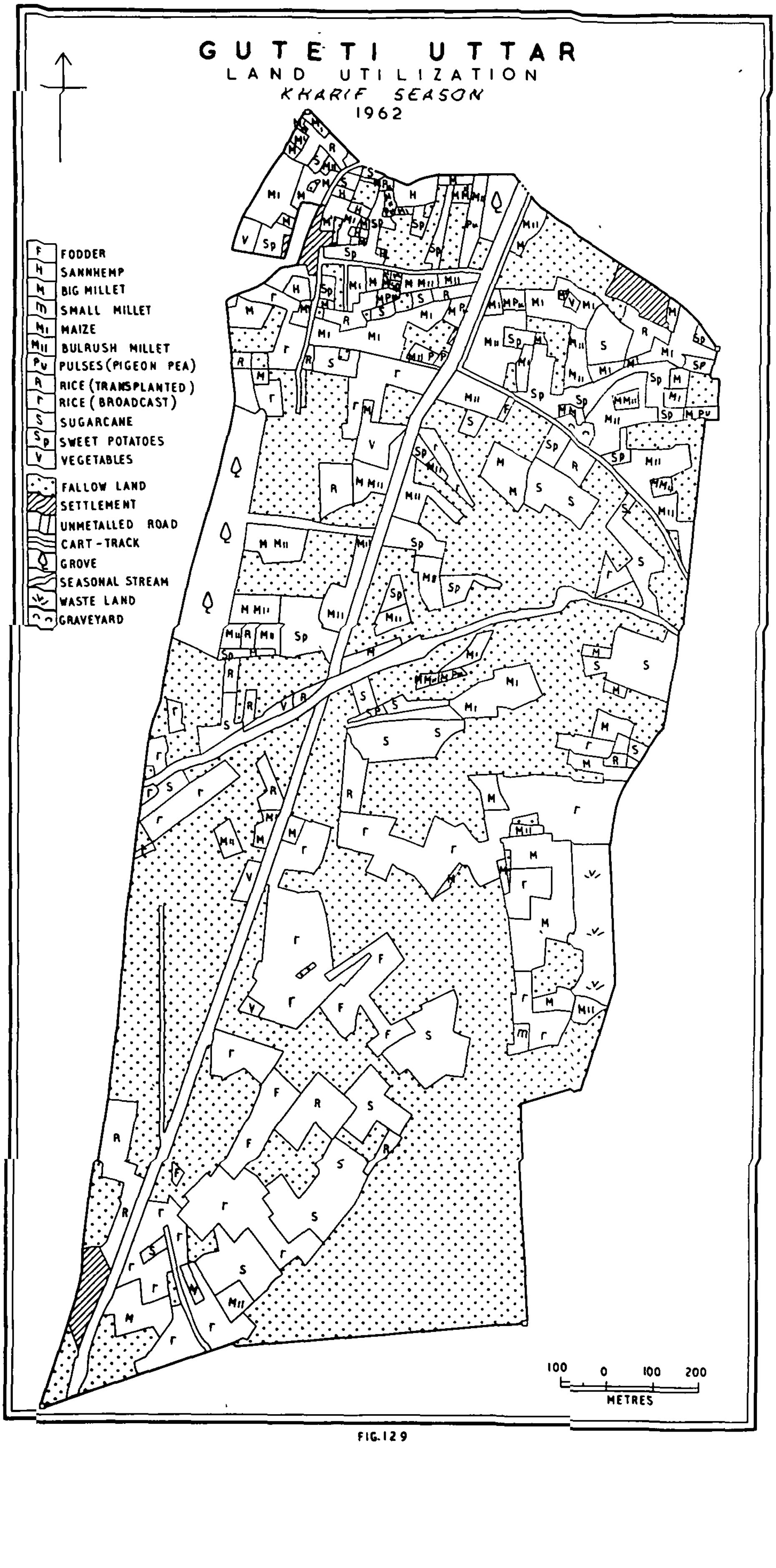

GUTETI UTTAR
LAND UTILIZATION
KHARIF SEASON
1962
F FODDER
H SANNHEMP
M BIG MILLET
m SMALL MILLET
Mi MAIZE
Mii BULRUSH MILLET
Pu PULSES (PIGEON PEA)
R RICE (TRANSPLANTED)
r RICE (BROADCAST)
S SUGARCANE
Sp SWEET POTATOES
V VEGETABLES
FALLOW LAND
SETTLEMENT
UNMETALLED ROAD
CART-TRACK
GROVE
SEASONAL STREAM
WASTE LAND
GRAVEYARD
100 0 100 200
METRES

FIG. 129

of the area occupied by each crop and its percentages to the total cultivated land and to the net cropped land are given in Table C VII.

TABLE C VII

Cultivated land : 548.85 acres
Net cropped land in the kharif season : 241.56 acres

Crops	Area in acres	Percentage to the total cultivated land	Percentage to the net cropped land.	Total percentage to the total cultivated land	Total percentage to the net cropped land
Grain crops				33.48	76.07
Rice (broadcast)	86.50	15.76	35.81		
Bulrush millet	36.47	6.65	15.10		
Big millet	27.02	4.92	11.18		
Maize	25.06	4.57	10.37		
Bulrush millet with pulses	4.51	0.82	1.87		
Big millet with pulses	3.70	0.67	1.53		
Small millet	0.51	0.09	0.21		
Other crops				10.53	23.93
Sugarcane	43.94	8.00	18.19		
Sweet potato	13.11	2.39	5.43		
Sannhemp	0.38	0.07	0.16		
vegetables	0.20	0.04	0.08		
Groundnuts	0.16	0.03	0.07		
Fallow	307.29	55.99		55.99	
Total	548.85	100.00	100.00	100.00	100.00

The above Table shows that out of the total land under cultivation only 44.01 % has been cropped in the kharif season and 55.99 % has been under following.

The 76.07 % of the net cropped area in the kharif season is under the grain crops, while 23.93 % is under non-cereal crops.

Among grain crops, the broadcast rice is the biggest crop of the season, being 35.81 % of the net cropped land. Bulrush millet occupies the second place, 15.10 %, while big millet and maize have considerable acreage; small millet, bulrush millet and big millet sown with pulses (pigeon pea) are the smallest grain crops. The transplanted rice is no grown in the village.

Among non-cereal crops, the crop of sugarcane[1] is the largest being 18.19 % of the net cropped land; while sweet potato, has a considerable area. The crope of sannhemp, vegetables and groundnut are the smallest.

The largest part of the total cultivated land in village, 55.99 %, is under fallowing in the season.

LAND UTILIZATION IN THE RABI SEASON

The cropland use in the rabi season, 1962-63, and other uses of land are depicted in Fig. 130. The area under each crop and its percentages to the total land under cultivation and to the net cropped area are summarised in Table C VIII

---

1. Sugarcane crop is locally known as 'Ponda', when on the field, and as 'ganna' when harvested.

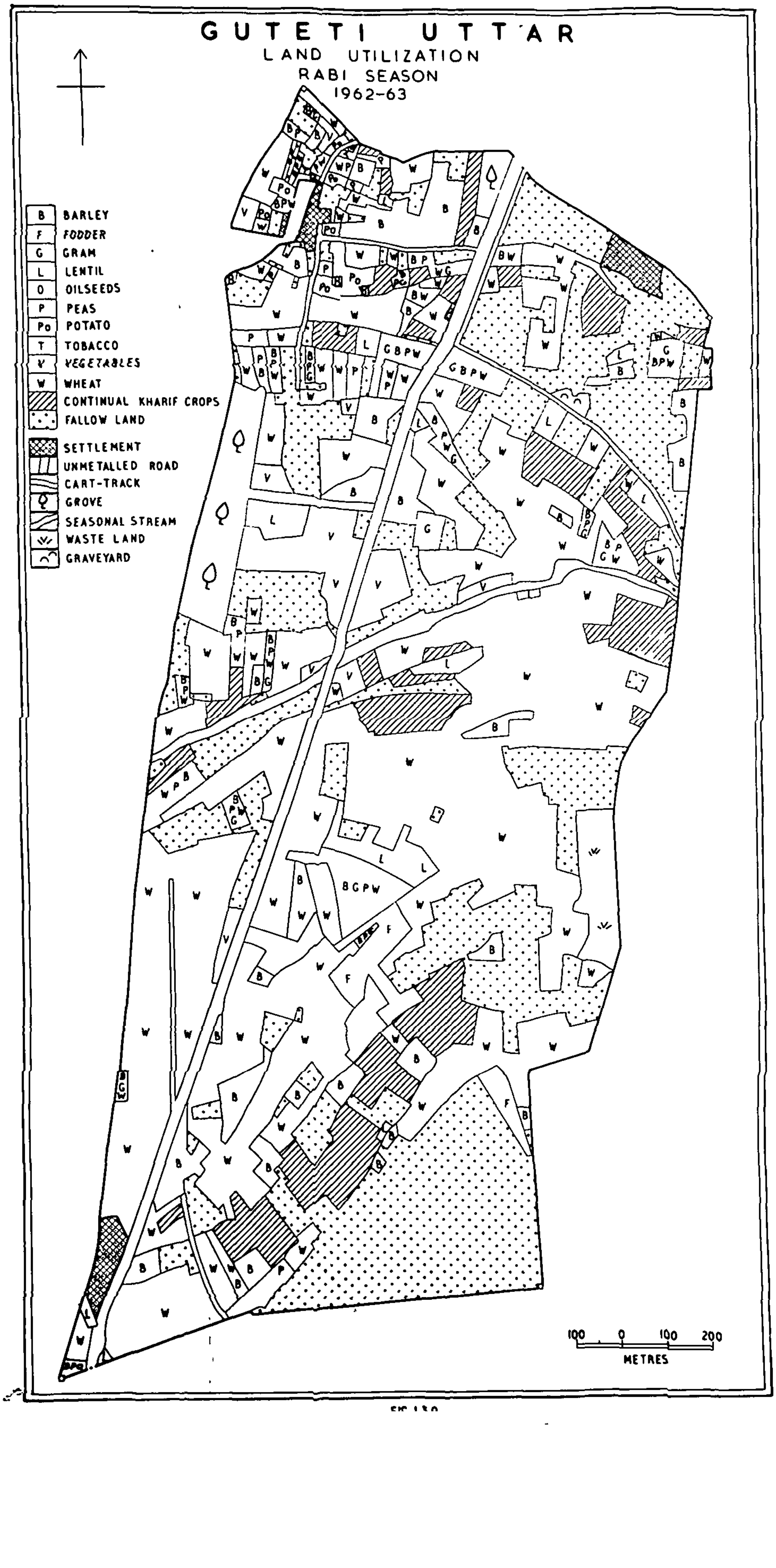

GUTETI UTTAR
LAND UTILIZATION
RABI SEASON
1962-63
B BARLEY
F FODDER
G GRAM
L LENTIL
O OILSEEDS
P PEAS
Po POTATO
T TOBACCO
V VEGETABLES
W WHEAT
CONTINUAL KHARIF CROPS
FALLOW LAND
SETTLEMENT
UNMETALLED ROAD
CART-TRACK
GROVE
SEASONAL STREAM
WASTE LAND
GRAVEYARD
100 0 100 200
METRES

Table C VIII

Total cultivated land ..... 548.85 acres
Net cropped land in the rabi season ..... 313.26 acres

	Area in acres	Percentage to the total cultivated land	Percentage to the total net cropped land.	Total percentage to the total cultivated land	Total percentage to the net cropped land
Grain crops				55.16	96.62
Wheat	143.77	26.20	45.90		
Barley	121.56	22.15	38.80		
Barley-gram-peas (mixed)	24.11	4.39	7.70		
Peas	7.80	1.43	2.48		
Lentil	5.41	0.99	1.73		
Other crops				1.94	3.38
Fodder	7. 77	1.41	2.48		
Potato	2.64	0.49	0.84		
Oilseeds	0.10	0.02	0.03		
Tobacco	0.10	0.02	0.03		
Fallow	183.44	33.40		33.40	
Continual kharif crops	52.15	9.50		9.50	
Total	548.85	100.00	100.00	100.00	100.00

It will be seen from the above Table that (55.16 + 1.94 =) 57.1 % of the total land under plough has been cropped in the rabi season, while 33.40 % is fallow land and 9.50 % under the continual kharif crops during the season.

Out of the net cropped land in the rabi season, 96.62 % is under grain crops and only 3.38 % under other crops. Among the grain crop wheat is the predominant crop, with 143.77 acres or 45.9 % of the net cropped land. Barley has second place, being 38.8 %; while other crops are smaller, like peas (alone or mixed with barley-gram, and lentil.

Among other crops, fodder occupies the major position, 2.48 % of the net sown area; potato is the next crop and crops of oilseeds and tobacco are the smallest.

The fallowing in the rabi is less than that of the kharif season. The above two Tables of the kharif and rabi reveal that the land is more cropped in the rabi than the kharif. The less proportion of the net cropped area in the kharif season as compared to that of rabi season is partly due to shortage of rainfall in the sowing period of kharif crops, and partly owing to less fertility of soil. The bigger net sown area in rabi is also due to cropping the land newly silted by the Ganga and left free for cultivation in the rabi season. The continual kharif crops are sugarcane and pulses (pigeon pea).

DOUBLE CROPPED LAND

The area cropped in both the kharif and the rabi seasons is depicted in Fig. 131. It occupies an area of 179.91 acres or 32.8 % of the total land under cultivation in the village. All the double cropped area possesses good quality (A) land. Increase in application

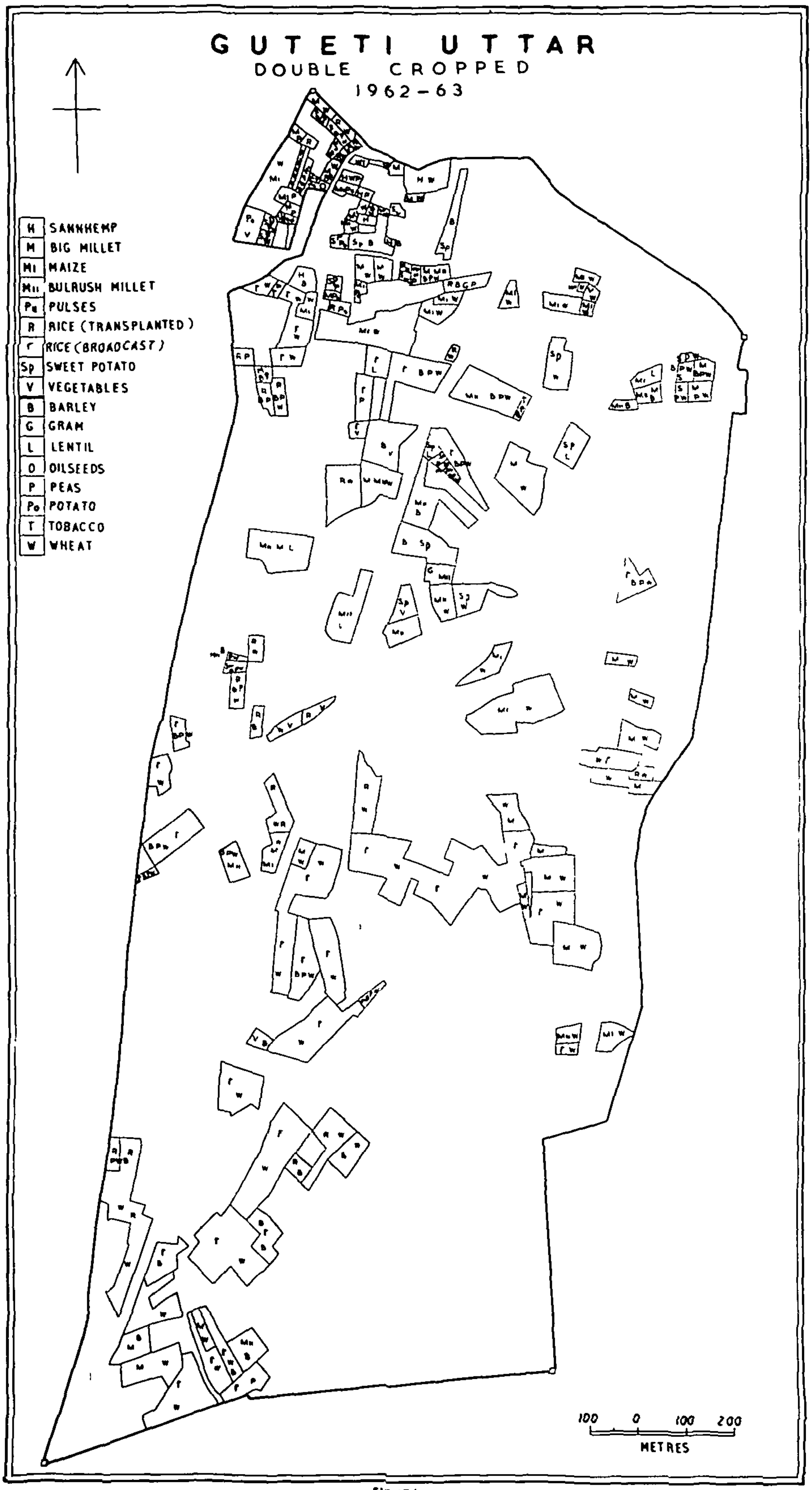

GUTETI UTTAR
DOUBLE CROPPED
1962-63
H SANNHEMP
M BIG MILLET
Mi MAIZE
Mii BULRUSH MILLET
Pu PULSES
R RICE (TRANSPLANTED)
r RICE (BROADCAST)
Sp SWEET POTATO
V VEGETABLES
B BARLEY
G GRAM
L LENTIL
O OILSEEDS
P PEAS
Po POTATO
T TOBACCO
W WHEAT
100 0 100 200
METRES

FIG 131

of manures and /or increase in deposition of '<u>panga</u>', the fine fertile silt brought by the great river, may, as a result, convert a considerable part of B lands into A lands for coming seasons , subject to the safety from flood. The per capita share of the double cropped land is 0.674 acre.

ROTATION OF CROPS

The usual rotations of crops in the village are similar to those prevalent in the previous village. Rice, millets, maize, wheat and barley are generally rotated in the good quality lands, while maize, sweet potato, millets, pulses, barley, peas, fodder and lentil are grown in medium quality lands during either the kharif or the rabi season with fallowing in the other season.

LAND USE AND POPULATION

The total population dependent upon the produce of the village is 267, which includes the persons living in a neighbouring village but cultivate in this village and are exclusively dependent upon its produce. It also excludes the persons who live in this village but depend upon the land situated in other village. Table C IX gives the total cultivated land, net cropped lands in kharif and rabi seasons, gross cultivated area and the double cropped land; and per capita share in each of them has also been given in it.

TABLE C IX

Total population, village Guteti Uttar : 267

(Area in acres)

	Total area of the village	Total cultivated land[1]	Net cropped land in the kharif season 1962	Net cropped land in the rabi season (1962-63)	Gross cultivated land (of both kharif and rabi seasons)	Double cropped land
	650.42	548.85	241.56	313.26	554.82	179.91
Land per head of population	2.436	2.056	0.905	1.173	2.078	0.674

The above Table reveals that per capita land available for cultivation is 2.056 acres. This land decreases to 0.905 acre in the kharif season due to large fallowing. But the per capita share increases to 1.173 acres in the rabi season on account of less fallowing and less area under continual kharif crops.

The gross cultivated land per head is 2.078 acres, but the double cropped land is only 0.674 acre per head of population.

The 95 % of the population are the primary rural or the peasants and the rest are the secondary rural who depend on the produce of the former class through their ancillary services of shopkeeping, blacksmith, carpenter and tailor. Most of the people are called 'Kahars' who, at their leisure, prepare baskets of 'jhaq', a wild shrub in every size.

1. It includes 173.94 acres of cultivated land which is under annual fallowing.

CALORIC INTAKE

The yield of various crops produced in the kharif and rabi seasons are given in Table C X A.

TABLE C X. A

Crops	Yield per acre (in kilograms)
Rice (broadcast) unhusked	373
Bulrush millet	165
Big millet	168
Maize	261
Bulrush millet (when sown with pulses)	103
Big millet (when sown with pulses)	103
Pulses (when sown with millets)	93
Small millet	136
Canesugar (gur)	783
Sweet potato	1,866
Barley	340
Peas	411
Lentil	108
Barley-gram-peas (mixed)	287
Potato	1,866
Wheat	336

The yield rates of crops in the good quality (A) lands are highest and their yields in medium type of lands are low.

On the basis of cropyield-rates of each crop, the total production of each of them in the village has been computed in order to get total caloric consumption which is worked out in Table C X- B.

Table C X- B gives the total yield of each food crop of the village. After the deduction of amounts of export[1] and the seeds perserved for next year's sowing, and after applying the extraction rates to the total available foodstuffs, the net food available is distributed to know per head per day consumption.

The amount of calories, thus obtained per head per day, is 1973 which signifies a state of under-nutrition in the village.

The largest caloric intake is from wheat : 306 calories, rice (broadcast) : 296, sugar : 224 ; the crops of bulrush millet, maize, barly, gram-peas (mixed), sweet potato, big millet and barley do also provide considerable calories. But other crops like peas, lentil and potato contribute very small amounts of calories.

POTENTIAL PRODUCTION UNIT

The lands, agriculturally productive and unproductive, have been evaluated to establish potential productivity of each of them in the light of various cropyields. Table C XI gives the relative productivity ratings of different types of lands. The total numbers of Potential Production Units of each type of land and the total P.P.U. for the whole village have been calculated.

---

1. Most of the export of this village goes to Jalalabad and Pirthipur Dh

TABLE CX B
FOOD BALANCE SHEET
Village GUTETI UTTAR
(in Kilograms)

Population 267

Year 1962-63

Commodity	Production	Total Production	Export	Import	Available Supply	Seed	Food (Gross)	Extraction rate per cent	Food (Net)	Per head Consumption: Kilograms per year	Per head Consumption: Grams per day	Per head Consumption: Calories per day
Rice (Broadcast)	32264.5	32264.5	17746	-	14518.5	2421.1	12097.4	66⅔	8064.9	30.205	82.8	295.6
Bulrush millet	6126.9)											
Bulrush millet (sown with pulses)	464.5)	6591.4	-	-	6591.4	216.9	6374.5	95	6055.8	22.681	62.1	216.1
Big millet	4539.4)											
Big millet (sown with pulses)	381.1)	4920.5	702.9	-	4217.6	161.7	4055.9	95	3853.1	14.431	39.5	135.5
Maize	7492.9	7492.9	1604.4	-	5888.5	233.8	5654.7	89	5032.7	18.849	51.6	183.7
Pulses (sown with millets)	763.5	763.5	-	-	763.5	8.2	755.3	95	717.5	2.687	7.4	25.4
Small millet	69.4	69.4	-	-	69.4	2.9	66.5	95	63.2	0.236	0.6	2.0
Sugar (gur)	34405.0	34405.0	24083.5	-	10321.5	4099.6	6221.9	-	6221.9	23.303	63.8	223.9
Sweet Potato	24463.3	24463.3	6848.7	-	17614.6	-	17614.6	83	14620.1	54.757	150.0	145.5
Wheat	48306.7	48306.7	32204.5	-	16102.2	6181.1	9921.1	90	8928.9	33.442	91.6	305.9
Barley	41330.4	41330.4	30997.0	-	10333.4	5227.1	5106.3	70	3574.4	13.387	36.7	121.8
Barley, gram and peas	6919.6	6919.6	-	-	6919.6	1060.8	5858.8	86⅔	5077.6	19.017	52.1	179.9
Peas	3205.8	3205.8	-	-	3205.8	397.8	2808.0	95	2667.6	9.991	27.3	94.5
Lentil	584.3	584.3	-	-	584.3	30.3	554.0	95	526.3	1.971	5.4	18.7
Potato	4926.2	4926.2	492.3	-	4433.9	343.2	4090.7	85	3477.1	13.023	35.7	24.9
Total												1973.4

TABLE CXI

AVERAGE YIELD PER ACRE OF NORMAL STANDARD
FARMLAND IN THE VILLAGE : 244 Kilograms or 1 P.P.U.

Type of land	Area in acres	Average yield in Kilograms per acre	Productivity rating per acre	Number of P.P.U.
A	223.85	458	1.88	420.84
B	325.00	244	1.00	325.00
C	57.37	0	0	0
Total	606.22			745.84

The above Table shows that the total number of the Potential Production Units of the village is greater than the area of all cultivated and unproductive lands. It is due to reasons of largest productivity rating per acre of the good quality (A) lands which have a large area; and secondly the smaller area of poor quality (C) lands as compared to the A and B quality lands under cultivation.

The good quality (A) lands are the largest contributor, -- 420.84 P.P.U., to the total P.P.U. amount of the village.

The medium quality (B) lands are equal to 1 P.P.U. per acre and possess the normal standard productivity. They have the largest area, providing 325 P.P.U. The poor quality (C) lands do neither produce a crop nor provide any P.P.U. to the total.

A good deposition of fine fertile silt on the B quality lands by the overflow of the Ganga may considerably turn a good part of them into good quality (A) land, especially when the land is also manured in the rabi season. The application of compost manure or human faeces may be greatly useful . But these measures can enrich the soil only when the great river does not wash them off and does not deposit coarse sand there-upon. The action of the river plays the predominant role in the Khadar lands.

LAND UTILIZATION IN SHAHZADPUR

Location

The village Shahzadpur is situated in the Tahsil Pawayan and is located at 80° 10' 50" E. long. and 28° 9' 35" N. lat. (Fig.132). It lies in the *Khadar* land of Gomati river which has a slope generally from north to south. The texture of the soil is predominantly sandy with occasional silt deposition. With the shortage or delay or failure of monsoon rainfall, the dry sandy soil becomes like a *bhur* soil. But with the advent of rain it rejuvenates to grow crops.

The village is bounded by the villages Haraina (Taluka Gadai Sanda) in the northwest, Deoria in the southwest, river Gomati in the northeast, and village Gutaiya in the east and southeast. The villages of Semra and Kuria are situated on the eastern side of the Gomati river which forms the *pargana* boundary between Pawayan & Khutar parganas.

The village is situated in the interior. It has no road and, therefore, the village is not easily accessible. From Pawayan it has a distance of about 11 Kilometres. However, the means of communication and transport are very limited and scanty.

Climate

The climatic data are not recorded for the village. However, the headquarters of Pawayan Tahsil record the rainfall data which are approximately the same as the rainfall conditions of the village.

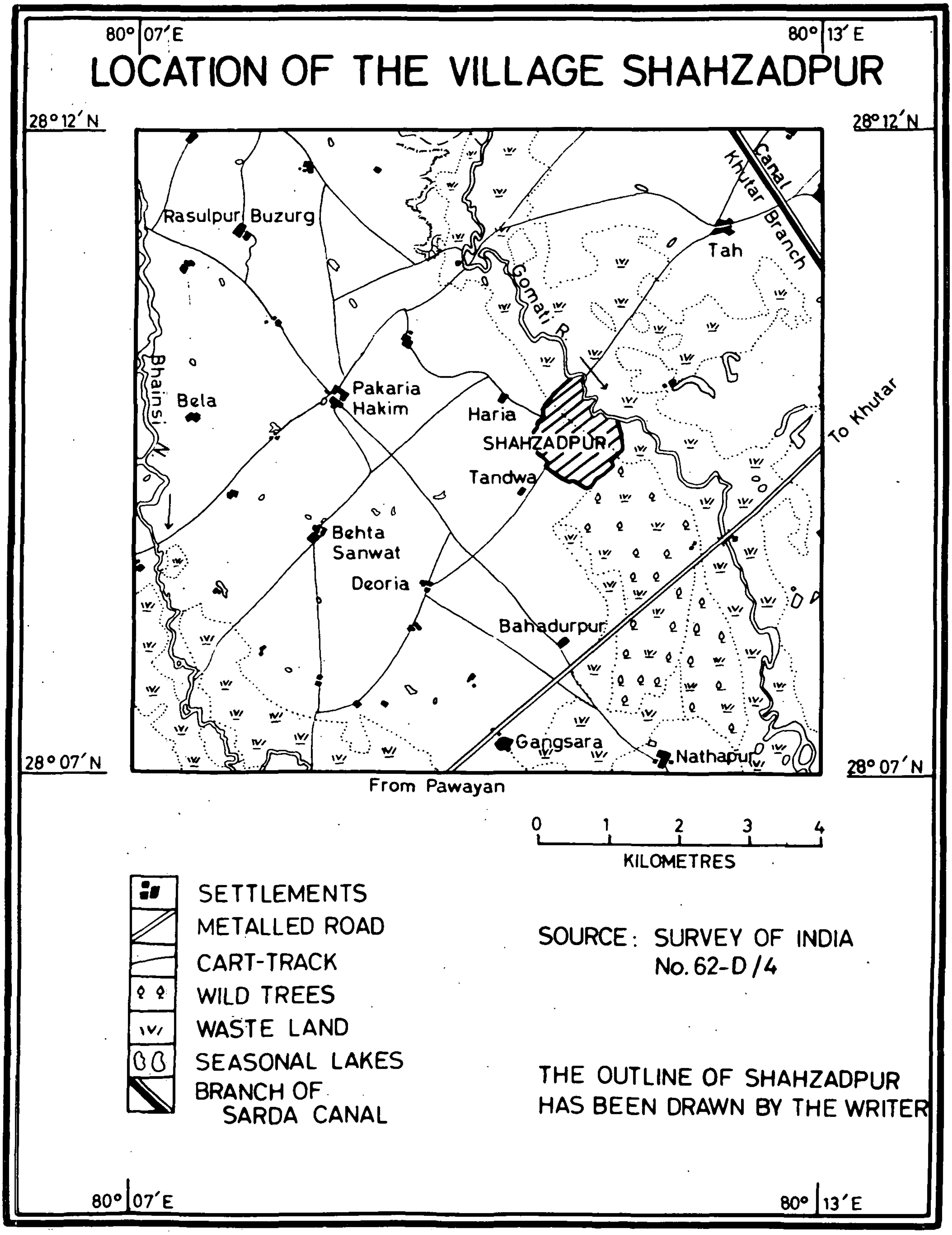

80° 07′ E
80° 13′ E
LOCATION OF THE VILLAGE SHAHZADPUR
28° 12′ N
28° 12′ N
Rasulpur Buzurg
Canal
Khutar Branch
Tah
Gomati R.
Bhainsi N.
Bela
Pakaria Hakim
Haria
SHAHZADPUR
Tandwa
To Khutar
Behta Sanwat
Deoria
Bahadurpur
Gangsara
Nathapur
28° 07′ N
28° 07′ N
From Pawayan
0 1 2 3 4
KILOMETRES
SETTLEMENTS
METALLED ROAD
CART-TRACK
WILD TREES
WASTE LAND
SEASONAL LAKES
BRANCH OF SARDA CANAL
SOURCE: SURVEY OF INDIA No. 62-D/4
THE OUTLINE OF SHAHZADPUR HAS BEEN DRAWN BY THE WRITER
80° 07′ E
80° 13′ E

FIG. 132

TABLE C XII

Kharif season, 1962 (Pawayan)

	MONTHS					
	June	July	Aug.	Sept.	Oct.	Total
Rainfall in millimetres in the Kharif season 1962	129.8	202.0	728.7	430.2	--	1490.7
Rainy days in the Kharif, 1962.	3	8	18	8	--	
Average rainfall in millimetres	139.3	330.9	330.3	204.3	70.5	1075.3

The above Table shows that June and July received a rainfall less than average of the months. Yet August and September received very much rainfall, more than double of their averages. But October was rainles , besides the monthly average of 70.5 millimetres. The large rainfalls in August and September resulted in the larger total of the season than the average rainfall. The good rainfall in the growing period of crops proved very useful for the Kharif crops, but fields adjacent to the river did not produce any Kharif crop due to overflow of the river and sand deposition from it.

TABLE C XIII

Rabi season, 1962-63 (Pawayan)

	MONTHS					
	Nov.	Dec.	Jan.	Feb.	March	Total
Rainfall in millimetres in the rabi season, 1962-63	--	--	36.0	--	19.6	55.6
Rainy days in rabi, 1962-63	--	--	2	--	2	
Average rainfall in millimetres.	4.1	7.4	22.0	22.5	14.2	70.2

It will be seen from the above Table that the period of November and December was rainless, as against ~~besides~~ their total average rainfall of 11.5 millimetres. It was January before ~~when~~ the rainfall was sufficiently more than monthly average. February was rainless as against ~~besides~~ an average of 22.0 millimetres of rainfall. The March rainfall in the first fortnight, as in 1963, may be useful, but that in the second fortnight, it may delay the harvest of the standing rabi crops which readily begin to ripen.

The conditions of underground water-table in this area are not like those in the Ganga Khadar areas. The underground water-table of this village area remains low as compared to that in the Khadar land of the Ganga. It is because the Gomati river has a smaller course, smaller volume of flow of water and smaller influence on the surrounding area than the Ganga. It is why the crops in the village Shahzadpur are irrigated unlike the crops of the Ganga-khadar villages, in both the seasons.

Land Classification

A classification of productive and unproductive lands has been worked out according to fertility and productivity and the categories marked are A, B_1, B_{11} and C according to the quality of land (Fig.133)

The good quality (A) lands are the lands which are either cropped twice during the year, in the *kharif* season and the *rabi*

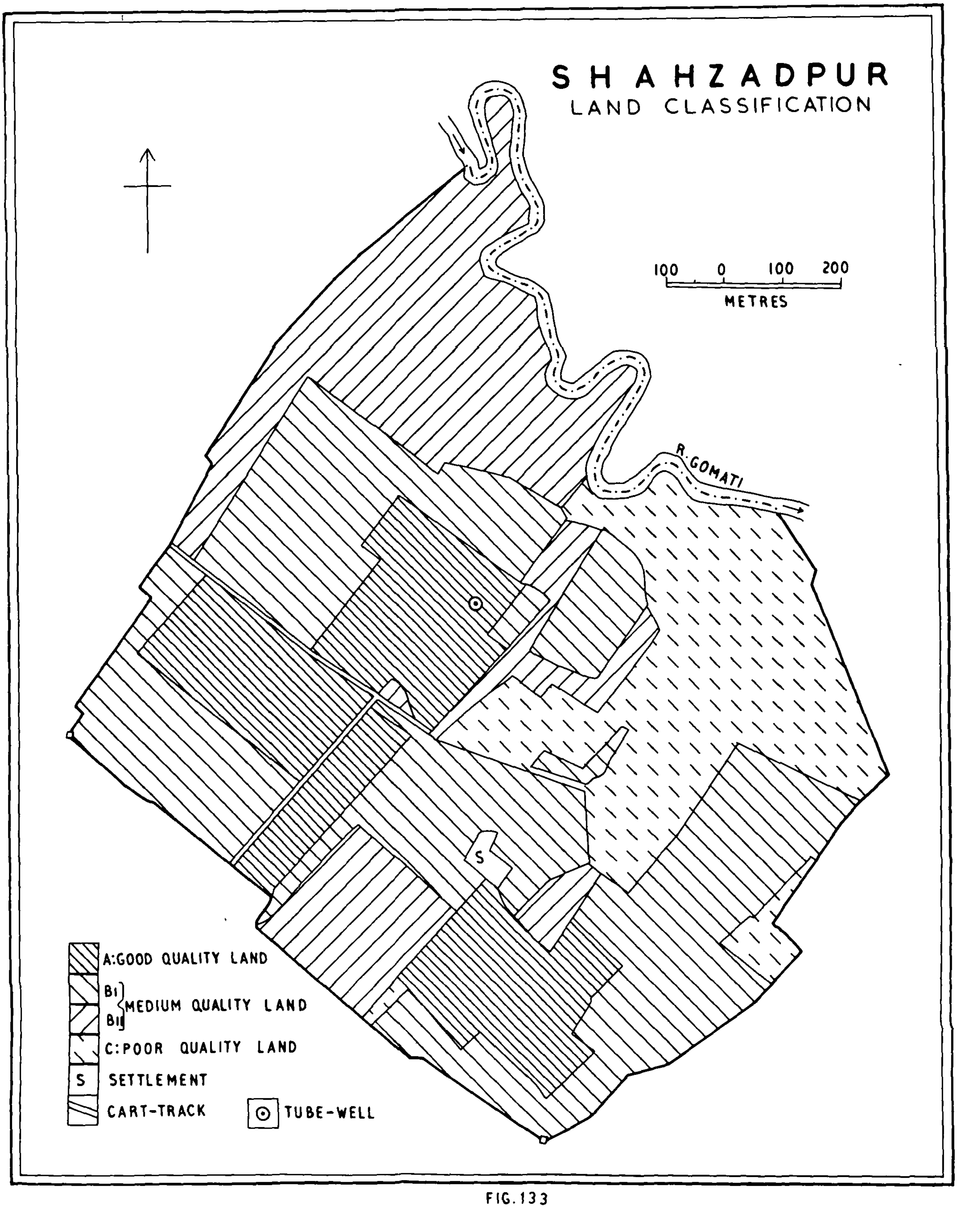

SHAHZADPUR
LAND CLASSIFICATION
100 0 100 200
METRES
R. GOMATI
S
A:GOOD QUALITY LAND
BI
BII
MEDIUM QUALITY LAND
C:POOR QUALITY LAND
S SETTLEMENT
CART-TRACK
TUBE-WELL

FIG.133

season, or the lands which are cropped with sugarcane. The crop of sugarcane can best be grown only in this type of land. The total area of A quality lands is 76.07 acres or 27.6% of the total land under cultivation.

The medium quality lands have been subdivided into B_1 and B_{11} lands. The medium quality B_1 lands are all those lands which are cropped in either the kharif or in rabi season and are left fallow in the other season. The area of B_1 lands is 115.61 acres or 41.1% of the total cultivated land, being the greatest among all types of lands. The crops usually grown in B_1 lands are big millet mixed with pulses, green-manure (dhaincha), barley, gram, and partly wheat and vegetables.

The medium quality B_{11} lands are still inferior to the B_1 lands, because they need fallowing for two or more continuous seasons for recuperation of fertility. The area of the B_{11} quality lands is 89.40 acre or 31.3 % of the total area under plough. The usual crops of B_{11} lands, when the lands are cropped, are the same in general as of the B_1 lands, especially millets and pulses (pigeon pea), fodder and barley.

The poor quality (C) lands have the least area, 3.30 acres or 1.14 % of the total area of the village. They practically do not produce a crop , hence are waste land. A wild grass known as Kans occupies most of the poor lands.

Irrigation

The cultivated land has been divided into irrigated and unirrigated portions. The irrigated lands have been demarcated as irrigated in kharif and irrigated in rabi in Fig. 134.

Fig.134 shows that only sugarcane is irrigated in the kharif season; while, on the other hand, a large area, consisting of the crops of wheat and gram, is irrigated in the rabi season.

The underground water-table remains about 4 metres below the surface during the cold weather season; while its level in the hot weather season is about 5 metres; but on the contrary, the depth in the rainy season comes upto about 3 metres below the surface.

The source of irrigation during the kharif and rabi seasons is the Tube-well, which has a capacity to irrigate an area of 5 to 6 acres in one day and night.

Land Utilization

The fields under cultivation and lands under other uses, in the year 1962-63, have been shown in Fig.135. The area occupied by each type of land use and its percentage to the total area of the village are given in Table C XIV .

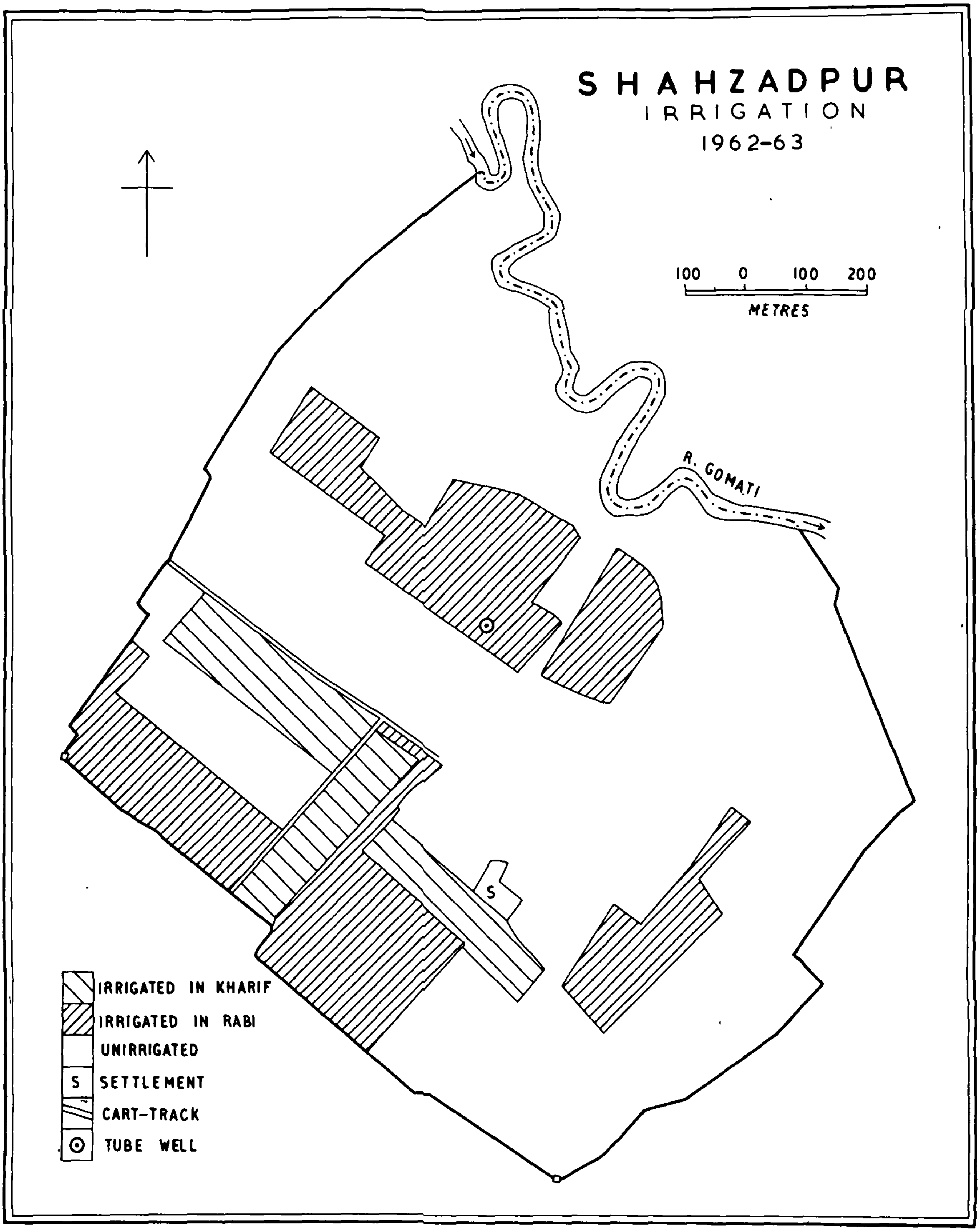

SHAHZADPUR
IRRIGATION
1962-63
100 0 100 200
METRES
R. GOMATI
S
IRRIGATED IN KHARIF
IRRIGATED IN RABI
UNIRRIGATED
S SETTLEMENT
CART-TRACK
TUBE WELL

FIG. 134

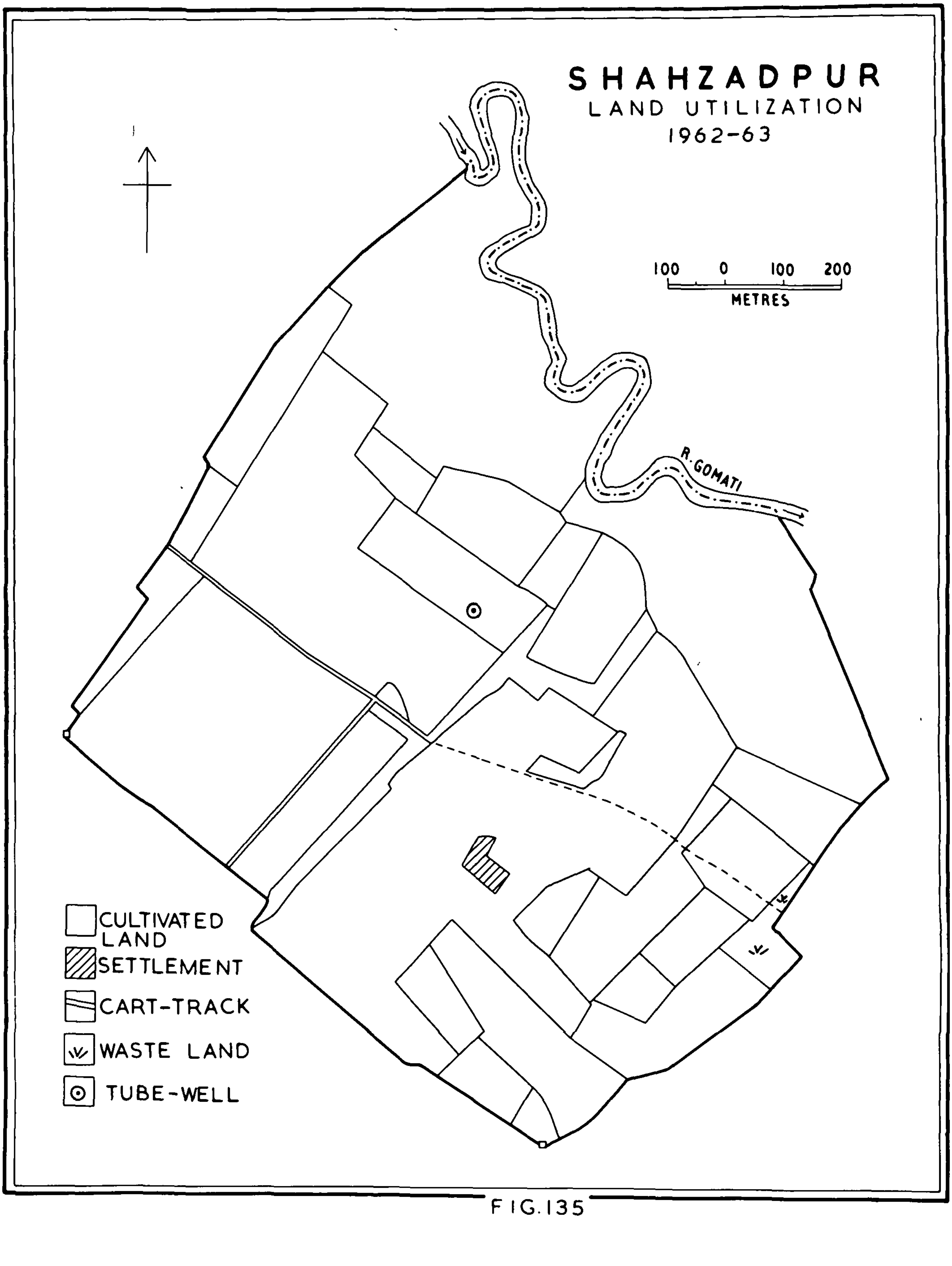

SHAHZADPUR
LAND UTILIZATION
1962-63
100 0 100 200
METRES
R. GOMATI
CULTIVATED LAND
SETTLEMENT
CART-TRACK
WASTE LAND
TUBE-WELL

FIG. 135

TABLE C XIV

Total area of the village ... 291.0 acres

Use of land	Area in acres	Percentage to the total area
Cultivated land	281.08	96.59
Waste land	3.30	1.14
Settlement	0.87	0.30
Cart-track	1.03	0.35
Land occupied by the river	4.72	1.62
Total	291.00	100.00

It will be seen from the above Table that 96.59 % of the total village area is under plough. Other lands are comparatively small, which are totally 3.41 % of the whole village.

Land Utilization in the Kharif season.

The area under each Kharif crop and other uses of land are shown in Fig. 136. The percentages of each crop to the total lanc under cultivation and to the net cropped land in the season ar summarised in Table C XV .

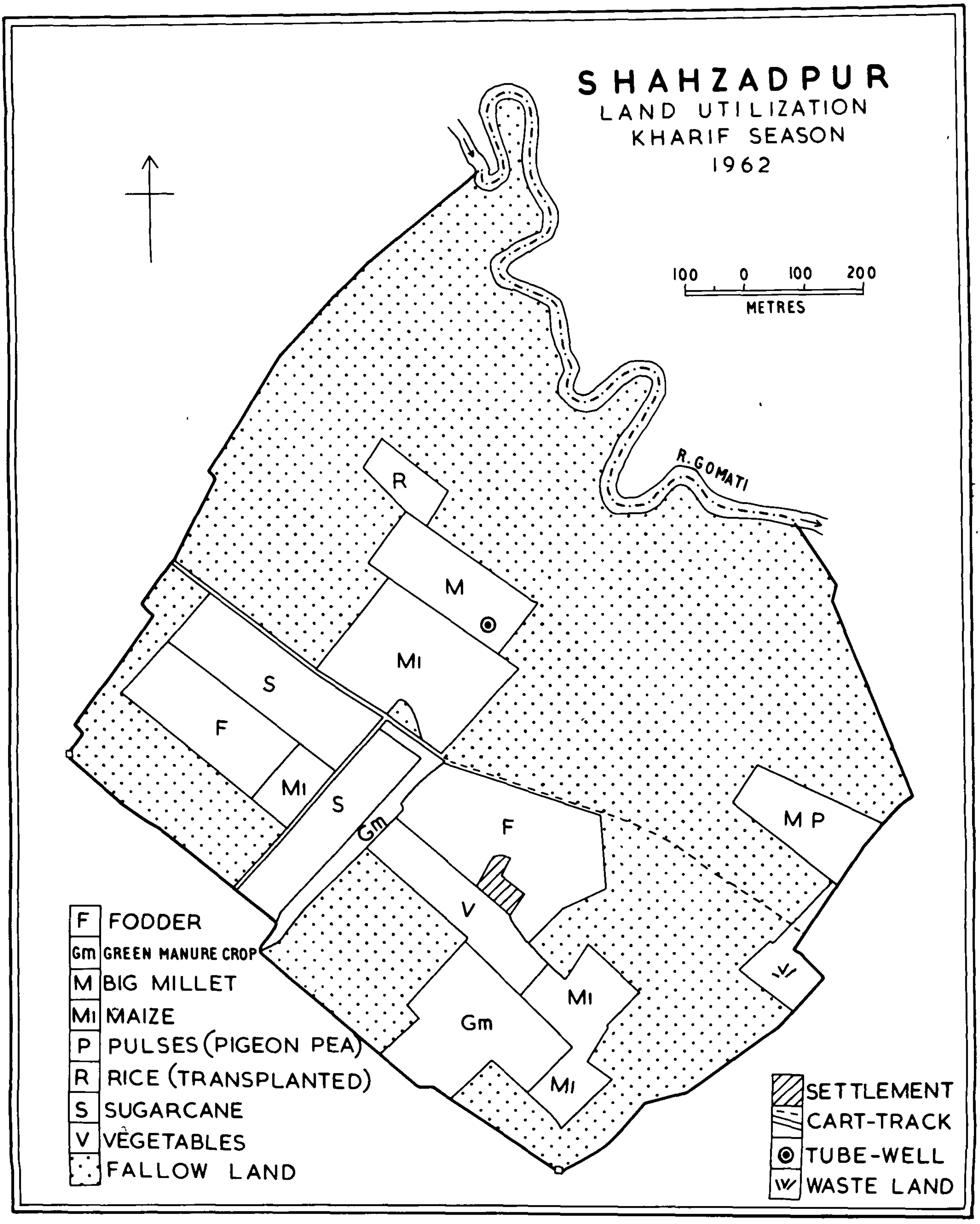

SHAHZADPUR
LAND UTILIZATION
KHARIF SEASON
1962
100 0 100 200
METRES
R. GOMATI
R
M
Mi
S
F
Mi
S
Gm
F
V
MP
Mi
Gm
Mi
F FODDER
Gm GREEN MANURE CROP
M BIG MILLET
Mi MAIZE
P PULSES (PIGEON PEA)
R RICE (TRANSPLANTED)
S SUGARCANE
V VEGETABLES
FALLOW LAND
SETTLEMENT
CART-TRACK
TUBE-WELL
WASTE LAND

FIG. 136

TABLE C XV

Total cultivated land ...... 281.08 acres
Net cropped land in the Kharif season ..... 78.46 acres

	Area in acres	Percentage to the total cultivated land	Percentage to the net cropped land	Total percentage to the total cultivated land	Total percentage to the net cropped land
Grain crops				6.09	21.82
Maize	9.93	3.53	12.65		
Big millet with pulses (pigeon pea)	5.00	1.78	6.37		
Rice (transplanted)	2.19	0.78	2.80		
Other crops				21.51	78.18
Fodder[1]	26.96	9.27	34.36		
Green manure crop (dhaincha)[2]	18.20	6.47	23.20		
Sugarcane	16.18	5.77	20.62		
Fallow	202.62	72.40		72.40	
Total	281.08	100.00	100.00	100.00	100.00

The above Table reveals that only 6.09 % of the total cultivated land is under grain crops and 21.51 % is under other crops. The greatest part of the cultivated land is under fallowing being 72.4 %.

1. The fodder crop includes rape, big millet fodder crop green ('chari')
2. The botanical name of 'dhaincha' is *Sesbania aculeata.*

The ratio of the grain crops and other crops is 21.82% and 78.18% of the net cropped area in the kharif season.

Among the grain crops, maize is predominant, 12.65% of the net sown area; big millet mixed with pulses is the second crop while the crop of transplanted rice[1] is the smallest in the village.

Among the non-cereal crops, fodder occupies the largest area being 34.36% '<u>Dhaincha</u>' — the green manure crop — is the second, 23.20% and sugarcane, the third crop being 20.62%.

It is remarkable that 72.4% of the whole land under cultivation is fallow, which denotes a large~~ness~~ proportion of medium quality lands.

<u>Land Utilization in the Rabi season</u>

The distribution of crops produced in the rabi season, 1962-63, and other uses of land are depicted in Fig. 137. Table CXVI gives a summary of each crop produced in the rabi season and its percentages to the total cultivated land and to the net cropped land.

TABLE CXVI

Total cultivated land ..... 281.08 acres
Net cropped land in the rabi season ..... 173.11 acres

<u>Grain crops</u>				57.13	92.77
Gram	79.38	28.24	45.85		
Wheat	64.55	22.96	37.29		
Barley	16.67	5.93	9.63		
<u>Other crops</u>				4.45	7.23
Oilseeds	12.51	4.45	7.23		
<u>Fallow</u>	86.79	30.88		30.88	
<u>Continual kharif crops</u>	21.18	7.54		7.54	
Total	281.08	100.00	100.00	100.00	100.00

1. The crop of rice is the least of all in the village. Its cropping and production in comparison to other crops is not good.

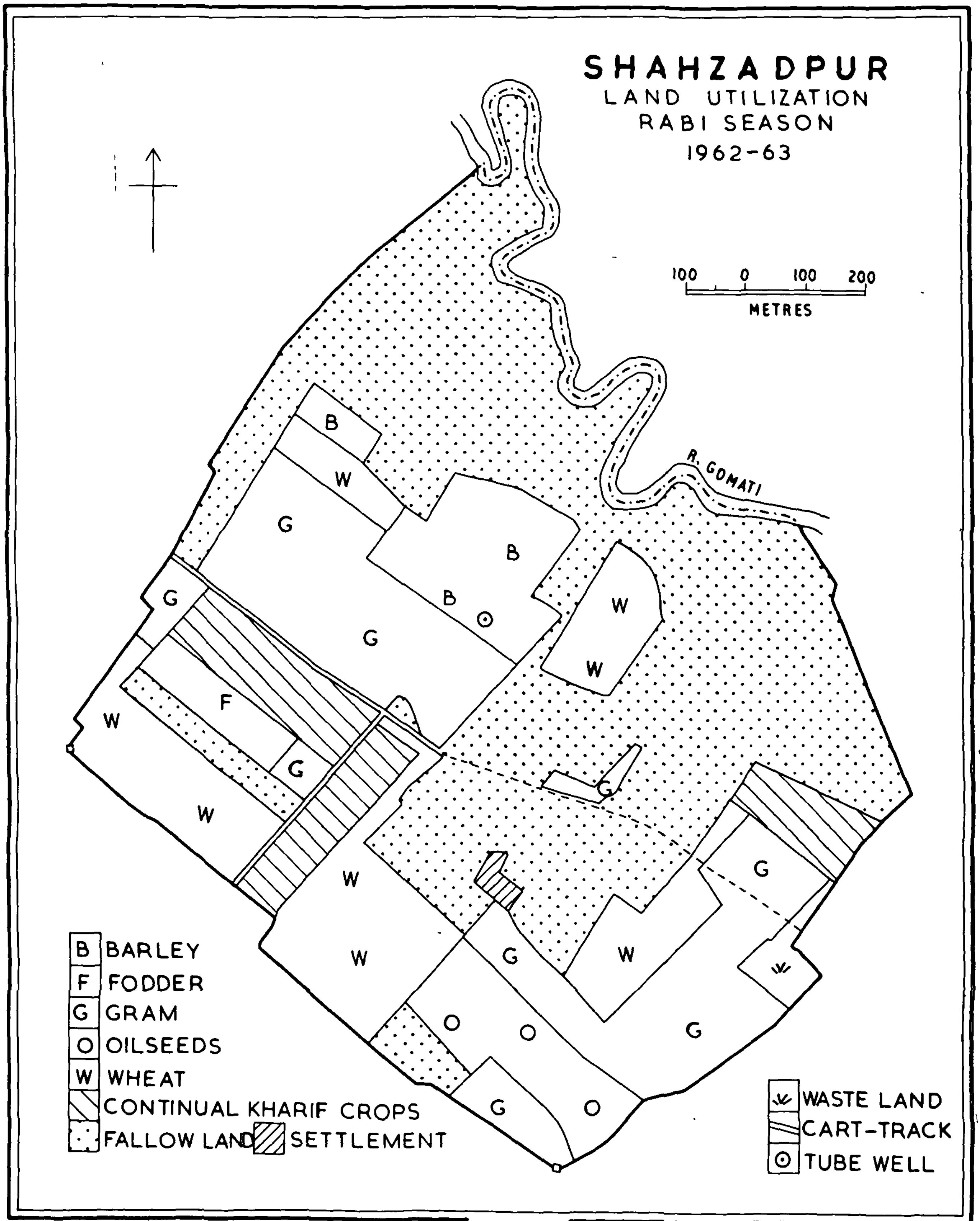

SHAHZADPUR
LAND UTILIZATION
RABI SEASON
1962-63
100 0 100 200
METRES
R. GOMATI
B BARLEY
F FODDER
G GRAM
O OILSEEDS
W WHEAT
CONTINUAL KHARIF CROPS
FALLOW LAND
SETTLEMENT
WASTE LAND
CART-TRACK
TUBE WELL

FIG. 137

The Table shows that (57.13 + 4.45) = 61.58% of the total land under cultivation is cropped in the rabi season. Only 7.54% is under the continual <u>kharif</u> crops while 30.88% is under fallowing.

Out of the net cropped land, 92.77% in the rabi season is cropped with the grain crops while only 7.23% remains under oilseeds. Among the grain crops, gram is the biggest being 45.85% of the net cropped land; wheat is the second crop, being 37.29% while barley is the third, being 9.63%.

There are no crops of fodder or green manuring in the rabi season, as fodder needs are fulfilled by the straw obtained from the cereal crops.

A comparison of the kharif and rabi Tables (CXV - CXVI) shows that the conditions of cultivation and fallowing in the kharif and rabi seasons are different. The biggest percentage of the net cropped land in the kharif season is under non-cereal crops (78.18%) while the biggest percentage in rabi is of cereal crops (92.77%). The smallest percentage in the net cropped land in the kharif is of grain crops while the smallest percentage in the rabi is of non-cereal crop (oil-seeds). The fallow land is 72.4% of the total land under cultivation in the kharif season while in the rabi season, it is 30.88%.

It is noteworthy that vegetables' are not cropped in either the kharif or the rabi season.

Double Cropped Land

The area cropped in the kharif and the rabi in the village known as the double cropped land is shown in Fig. 138. It has an area of 59.89 acres or 21.3 % of the total land under cultivation; it possesses good quality (A) lands. The increasing application of manures and timely irrigation may increase the area under double cropping. The double cropped land is 0.450 acre per head.

Rotation of Crops

Certain rotation of crops are adopted in the village. The rotations are generally similar to those in the previous villages. Fixed rules of rotation do not exist, they may change according to the change of one or more factors of rainfall, manuring and irrigation facilities. However, the best cultivating lands in the village, being A quality lands, are successively cropped in both the seasons. Most of the crops rotated in this type of land are maize, fodder, dhaincha (green manure), wheat, gram, oilseeds and sugarcane.

The B_1 lands are cropped in only one season of the crop year, kharif or rabi, and are left fallow in the other season for recuperation of fertility. Millets (with or without pulses), rice, maize, barley, and fodder crops are grown in these lands.

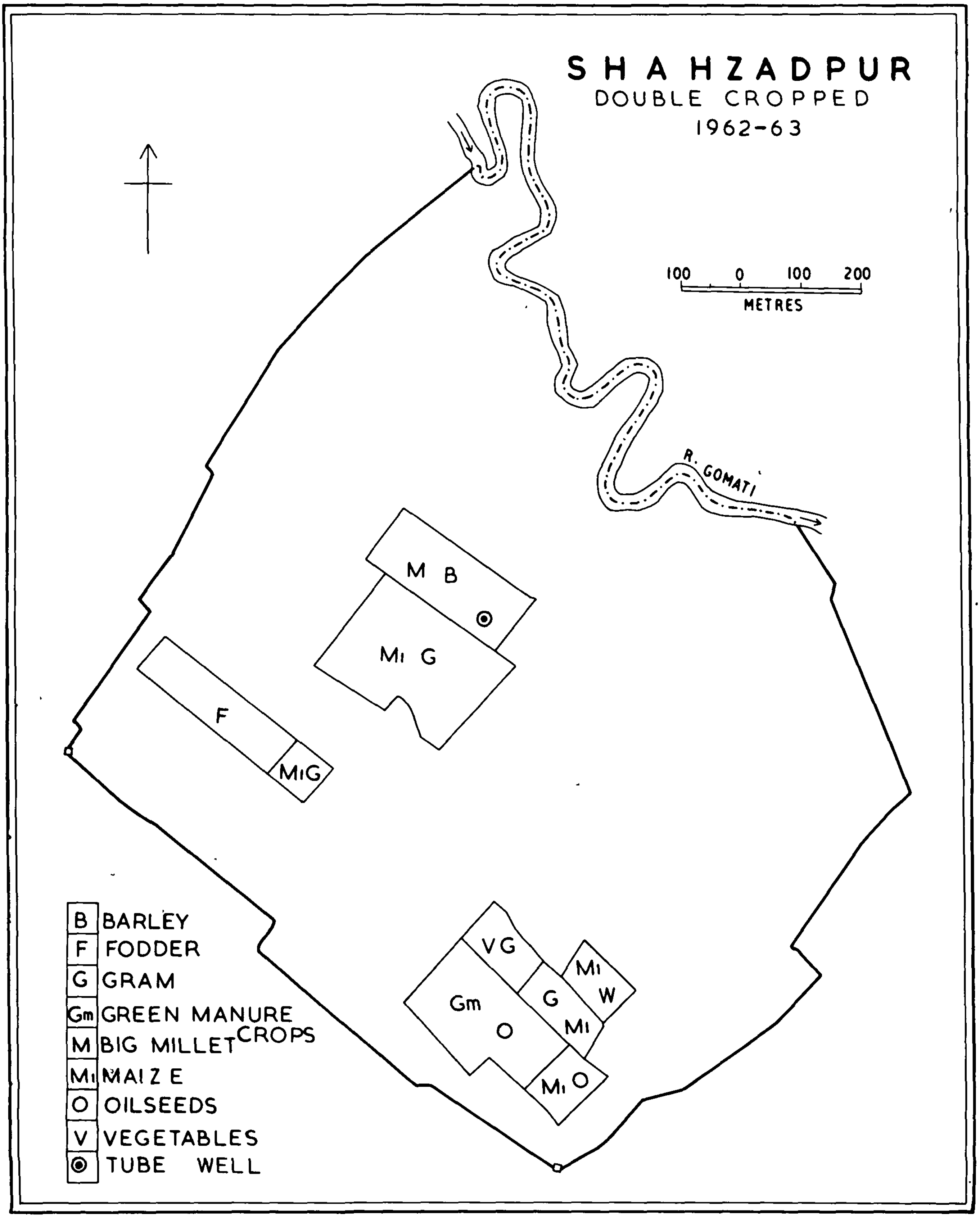

SHAHZADPUR
DOUBLE CROPPED
1962-63
100 0 100 200
METRES
R. GOMATI
M B
Mi G
F
MiG
VG
Mi
W
Gm
O
G
Mi
Mi O
B BARLEY
F FODDER
G GRAM
Gm GREEN MANURE CROPS
M BIG MILLET
Mi MAIZE
O OILSEEDS
V VEGETABLES
TUBE WELL

FIG. 138

The B_{11} lands, inferior to B_1 lands, are put to fallowing for two or more seasons so that, through recuperation of fertility, they may be able to produce one of the crops which are rotated in the B_1 lands in either the kharif season or the rabi season. Therefore the B_{11} lands do not possess rotation of crops. Any one crop in either the kharif or the rabi is produced after fallowing for two or more continuous seasons.

Land Use And Population

The total population dependent upon the produce of lands in Shahzadpur but living in both Shahzadpur and other adjacent villages, particularly Haraina and Deoria, is 133. Table C XVII has given the total amount and per capita share in each of the total cultivated land, net cropped land in the kharif season, net cropped land in the rabi season, gross cultivated land, and the double cropped land in the village.

TABLE C XVII

Total population, village Shahzadpur : 133

(Area in acres)

	Total area of the village	Total area under cultivation[1]	Net cropped land in the kharif season	Net cropped land in the rabi season	Gross cultivated land (of both kharif and rabi seasons)	Double cropped land
	291.00	281.08	78.46	173.11	251.57	59.89
Land per head of population	2.188	2.113	0.589	1.302	1.892	0.450

1. The total area under cultivation includes also 89.40 acres being under annual fallowing.

According to the above Table, the per capita share of the total land under cultivation is 2.113 acres in the village. It decreases to 0.589 acre in the kharif season due to largest area under fallowing. But in the rabi season, the per capita share increases to 1.302 acres due to less fallowing and larger cropping in the rabi season than the kharif.

The per capita share of the gross cultivated land is 1.892 acres which may be cited as the actual amount of land to support a person in the village. The double cropped land, is only 0.450 acre per head.

Out of the total population considered, 96 % are primary rural or the farmers and the rest, being secondary rural, are dependent upon field produce of the former class through their ancillary services like blacksmith-cum-carpenter, tailor, and shopkeeper.

<u>Caloric Intake</u>

The various yields of different crops produced in the kharif and rabi seasons in the village are given in Table C XVIII-A. A cropyield varies from one type of land to the other; but yield rates given are of the land in which certain crop is mostly grown. Moreover, the prevalent rates known to the cultivators have been taken. The yield rates in the A quality-land-crops are biggest.

TABLE C XVIII-A

Crops	Yield per acre (in kilograms)
Maize	448
Big millet (when sown with pulses)	103
Pulses (pigeon peas)-(when sown with millets)	84
Rice (transplanted) unhusked	373
Canesugar (gur)	783
Gram	336
Wheat	523
Barley	635

According to the yield-rates, the total production of each crop produced in the village has been calculated and total calories consumed therefrom by a person have been worked out in Table C XVIII-B.

Table C XVIII-B shows the total production of each food crop grown in the village. After deducting the amounts of exports and seeds preserved and applying the extraction rates, the total food available has been distributed on the population and per capita per day consumption of calories from each crop has been computed.

The total caloric intake is 1948 calories per head per day in the village which signifies under-nutrition in the people of the village.

TABLE CXVIII B
FOOD BALANCE SHEET
Village SHAHZADPUR

(in Kilograms)

Population 133

Year 1962-63

Commodity	Production	Total Production	Export	Import	Available Supply	Seed	Food (Gross)	Extraction rate per cent	Food (Net)	Per head Consumption Kilograms per year	Grams per day	Calories per day
Maize		3336.5	667.3	-	2669.2	87.9	2581.3	89	2297.4	17.274	47.3	168.4
Big millet (sown with pulses)		515.0	-	-	515.0	14.0	501.0	95	475.9	3.578	9.8	33.6
Pulses (sown with millet)		420.0	-	-	420.0	7.0	413.0	95	392.4	2.950	8.1	27.8
Rice (Transplanted		816.9	-	-	816.9	20.4	796.5	66⅔	531.0	3.993	10.9	39.1
Sugar (gur)		12668.9	7013.0	-	5655.9	1358.8	4297.1	--	4297.1	32.309	88.5	310.6
Gram		26671.7	17781.0	-	8890.7	3492.7	5398.0	95	5128.1	38.557	105.6	378.0
Wheat		33759.6	16879.8	-	16879.8	2388.4	14491.4	90	13042.3	98.062	268.7	897.5
Barley		10585.5	7939.0	-	2646.5	700.1	1946.4	70	1362.5	10.244	28.1	93.3
Total												1948.3

The largest amount of calories are obtained from wheat : 898; gram and sugar (gur) are also large contributors, maize is also a considerable crop to provide calories. Other crops like millets, pulses, rice and barley are smaller crops for calories.

Potential Production Unit

The various productive and unproductive lands have been assessed in order to ascertain their potential productivity according to the yield-rates of crops mostly grown therein.

Table CXIX has given the relative productivity ratings of different types of lands and thus the total numbers of Potential Production Units of each of them have been calculated.

TABLE CXIX

Average yield per acre of normal standard farmland in the village : 498 kilograms or 1 P.P.U.

Type of land	Area in acres	Average yield (in kilograms) per acre	Productivity rating per acre	Number of P.P.U.
A	76.07	585	1.17	89.00
B_1	115.61	498	1.00	115.61
B_{11}	89.40	261	0.52	46.49
C	3.30	0	0	0
Total	284.38			251.10

The above Table reveals that the total number of Potential Production Units is less than the total acreage of productive and unproductive lands. The good quality (A) lands are equal to 1.17 P.P.U. per acre; it has increased the number of P.P.U. to some extent. The largest amount of acreage under B_1 lands, 115.61, has given the equal number of P.P.U., as B_1 quality lands are equal to 1 P.P.U. per acre, and form the normal standard farmland in the village.

The B_{11} quality lands are equal to 0.52 P.P.U. per acre. In comparison of number of P.P.U. and the total area of A and B_{11} quality lands each, the reduction of amount of P.P.U. by B_{11} lands is greater than the addition of P.P.U. to the total by A quality lands.

Moreover, the C quality lands have neither any crop production nor provide any P.P.U. to the total number of P.P.U. of the village.

The productivity of a considerable part of B_{11} lands may be raised to that of B_1 lands through the measures of manuring and irrigation. The green manuring, which is now a good crop, may be the best source to increasingly manure such lands.

Similarly, good manuring with compost and green manures and increasing application of irrigation may improve the productivity of a considerable part of B_1 lands to that of A quality lands.

CHAPTER XI

LAND UTILIZATION IN BHUR KHITAURA

LOCATION

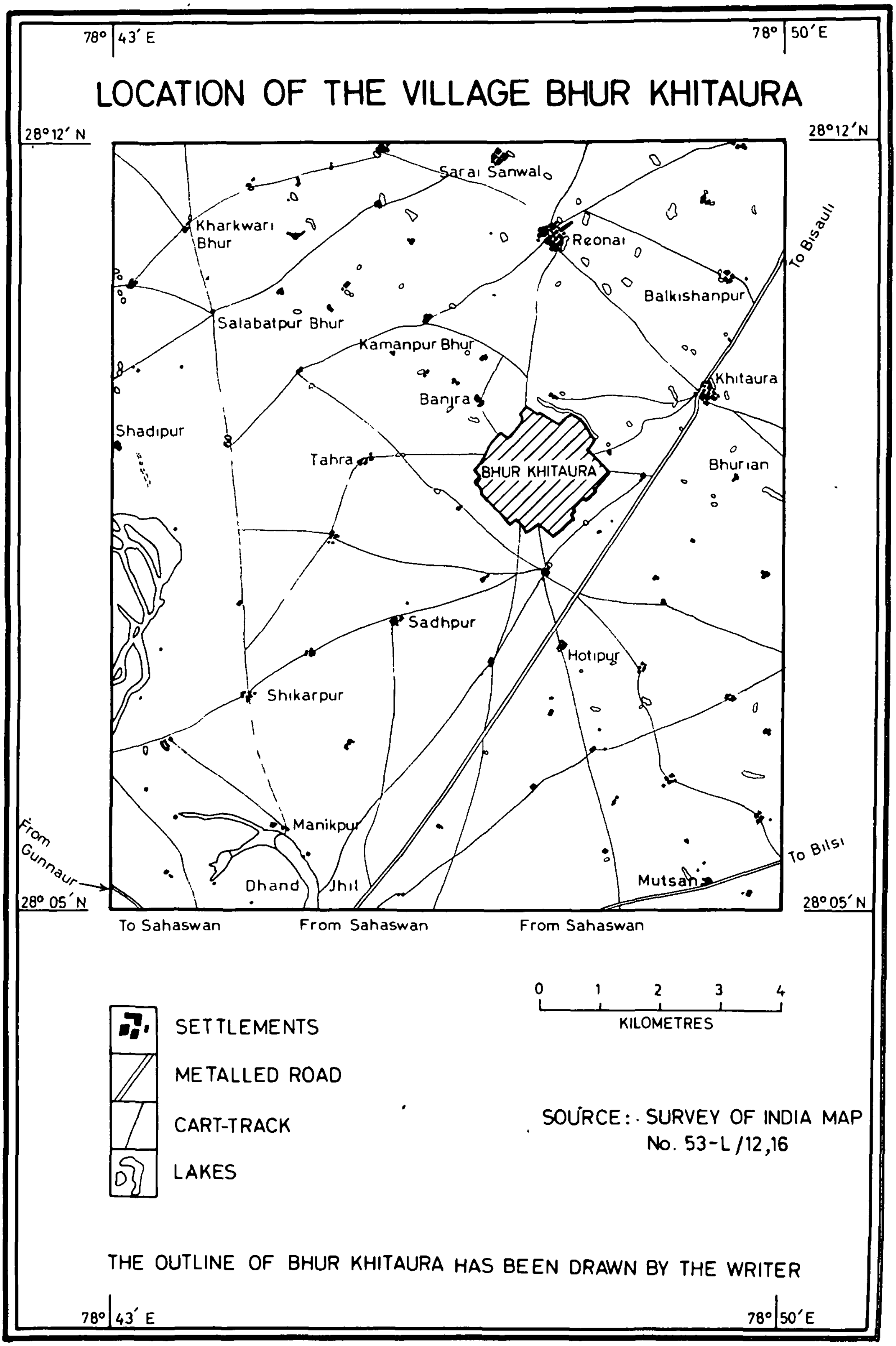
The village Bhur Khitaura, lying in Sahaswan Tahsil, is situated at $78^{\circ}47'25''$ E.long. and $28^{\circ}9'5''$ N. lat. The land in general consists of <u>bhur</u> soil. Fig. 139 shows the location of the village. It is bounded by the villages of Rafatpur in the northwest, Aripur in the southwest, Khitaura Lan a Kundan in the northeast, Sultanpur Tappa Ahmadnagar in the southeast, Khitaura Bhagwant in the north and Mohammadpur Najjam in the south.

The settlement is about in the centre of the village. The means of transportation with the surrounding villages are generally cart-tracks.

CLIMATE

No climatic data are recorded in the village. However, the data of rainfall recorded at Tahsil headquarters of Sahaswan which is about 7 kilometres away from the village, may be taken as a close approximation of the rainfall conditions in the village. The Tables LXXII and LXXIII (given in Chapter VIII) show the rainfall in the crop seasons of the year. It will be seen from Table LXXII that first three months of the <u>kharif</u> season, 1968, received a deficient rainfall, being less than the monthly averages, during early and the growing period of kharif crops. September got an excessive rainfall but October was rainless. It resulted in a deficient total rainfall in the season, with a shortage of 149 millimetres from the seasonal average.

The Table LXXIII reveals that the first two months the <u>rabi</u> season, November and December, were rainless. But the month of January received a fair amount of rainfall. February and March received deficient rainfall. The total seasonal rainfall, as a result, was much short of average.



LOCATION OF THE VILLAGE BHUR KHITAURA
78° 43′ E
78° 50′ E
28° 12′ N
28° 05′ N
Sarai Sanwal
Kharkwari Bhur
Reonai
Balkishanpur
To Bisauli
Salabatpur Bhur
Kamanpur Bhur
Khitaura
Banjra
Shadipur
Tahra
BHUR KHITAURA
Bhurian
Sadhpur
Hotipur
Shikarpur
Manikpur
From Gunnaur
Dhand Jhil
Mutsan
To Bilsi
To Sahaswan
From Sahaswan
From Sahaswan
0 1 2 3 4
KILOMETRES
SETTLEMENTS
METALLED ROAD
CART-TRACK
LAKES
SOURCE:- SURVEY OF INDIA MAP
No. 53-L/12,16
THE OUTLINE OF BHUR KHITAURA HAS BEEN DRAWN BY THE WRITER

FIG. 139

LAND CLASSIFICATION

The cultivated and uncultivated fields of the village have been classified on the basis of productivity into the good quality (A) lands, medium quality (B) lands and poor qulaity (C) lands (Fig.140).

The area occupied by the good qulaity lands is 64.250 acres which is only 9.2 per cent of the total area under plough in the village. The land is fairly level. The A quality lands are generally found around the village settlement; their soil is better than in the other lands; it is due to regular application of human refuse throughout the year. The good quality lands produce two crops in a year while sugarcane is also grown in this type of land.

The medium quality (B) lands, inferior to the A quality lands, are cropped in either the kharif season or the rabi season after fallowing for one or more seasons. This category of lands is 90.8 per cent of the village's total land under cultivation. Its area in the village is 631.347 acres. These lands are generally devoted to the cultivation of bulrush millet mixed with pulses, groundnut and fodder crops in the <u>kharif</u>, or wheat, barley mixed with wheat or peas in the <u>rabi</u> season. The poor quality (C) lands have a total area of 7.406 acres or 1 per cent of the area of the village. These lands are unproductive.

IRRIGATION

The cultivated lands, subdivided into irrigated and unirrigated, are shown in Fig.141. Sugarcane is irrigated in both the <u>kharif</u> and <u>rabi</u> seasons. Millets, pulses and groundnut, occupying the biggest <u>kharif</u> sown area in the village, have no need of irrigation. But for the <u>rabi</u> crops, irrigation is important where available, particularly for wheat, barley and peas.

Insufficient rainfall in the kharif and rabi seasons increases the need of irrigation, especially for a <u>bhur</u> sandy soil. The deficiency of rainfall and irrigation affects adversely upon quality and yield of crops. However, a

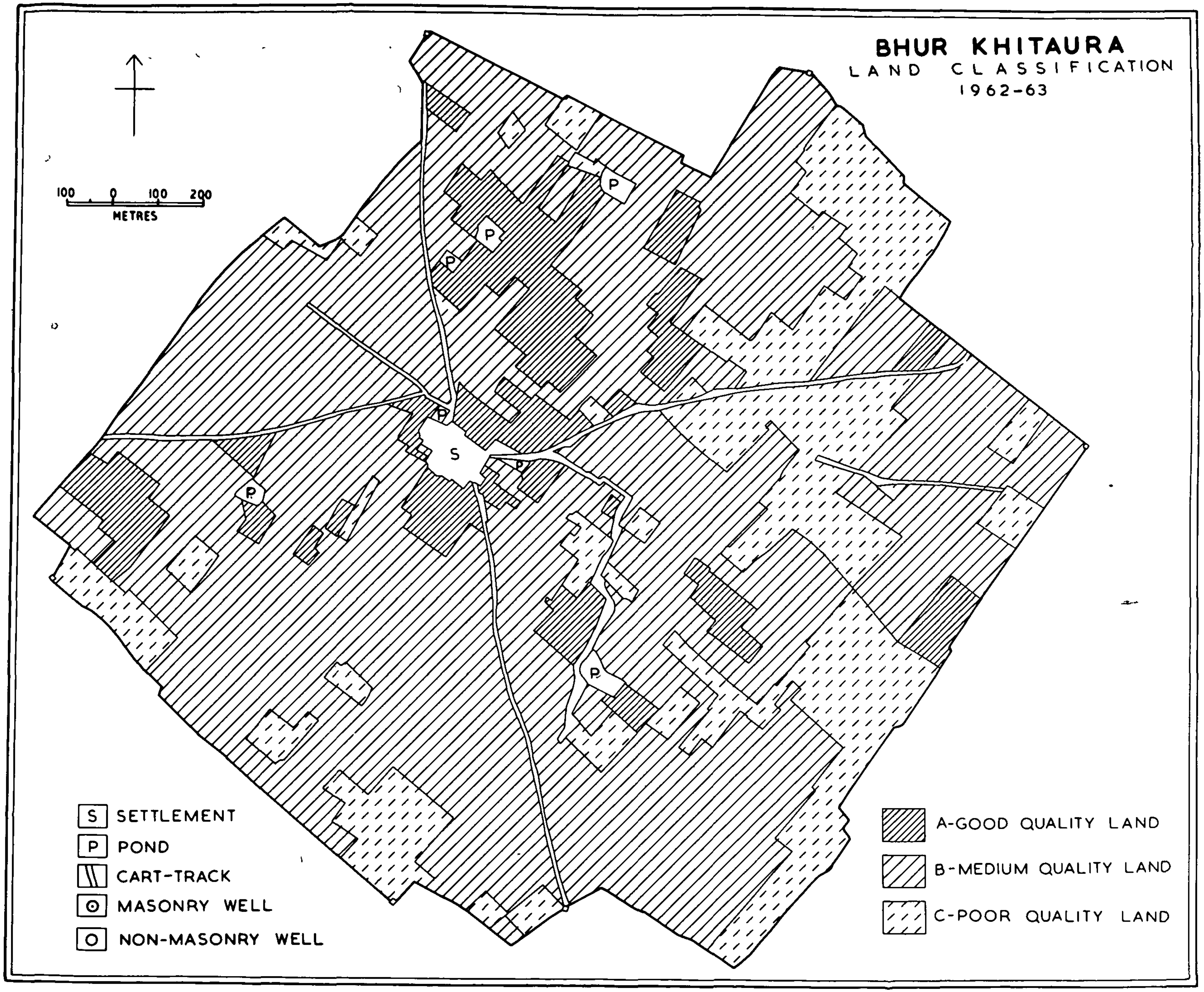

BHUR KHITAURA
LAND CLASSIFICATION
1962-63
100 0 100 200
METRES
S
P
SETTLEMENT
POND
CART-TRACK
MASONRY WELL
NON-MASONRY WELL
A-GOOD QUALITY LAND
B-MEDIUM QUALITY LAND
C-POOR QUALITY LAND

FIG. 140

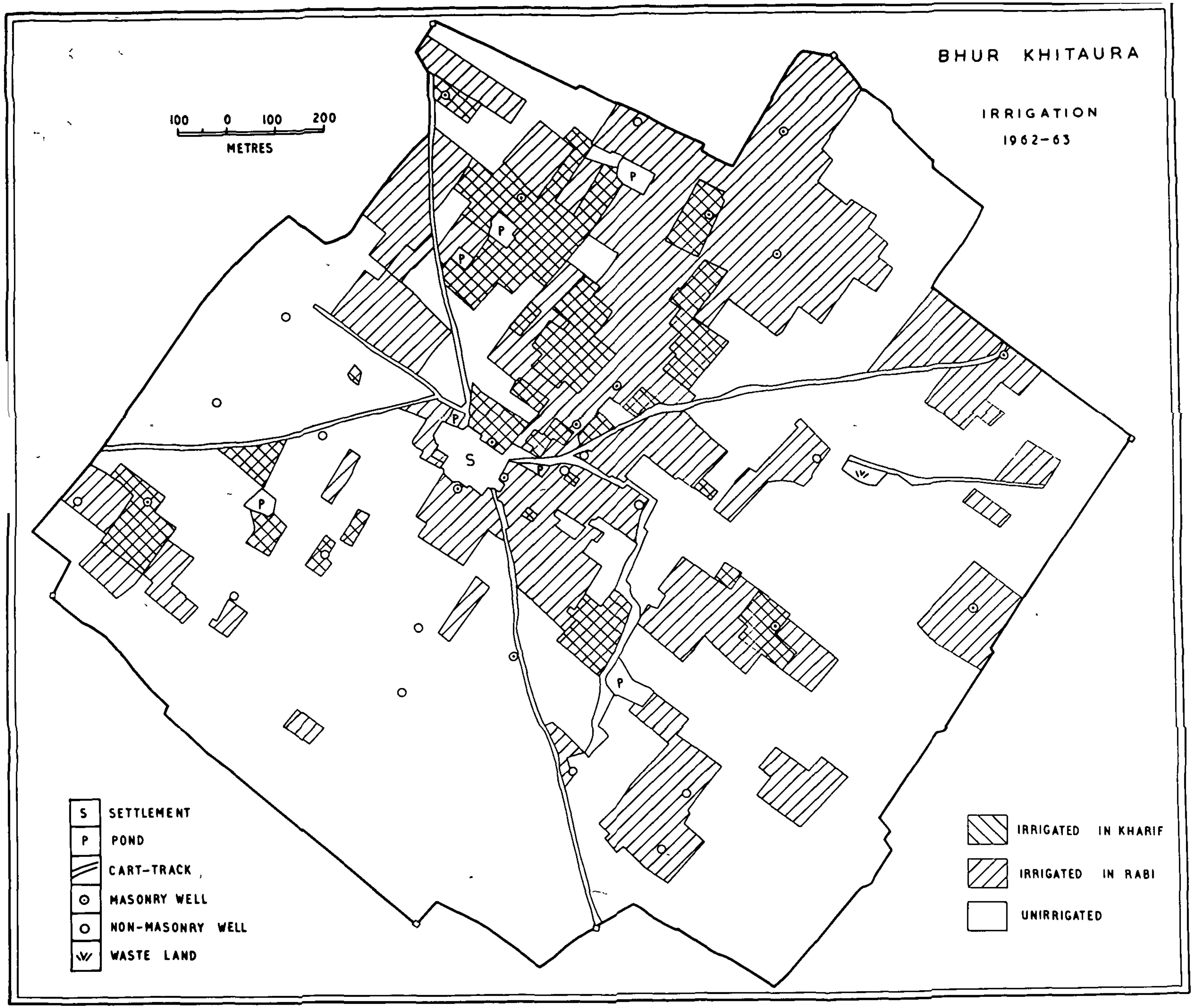

BHUR KHITAURA
IRRIGATION
1962-63
100 0 100 200
METRES
S
P
S SETTLEMENT
P POND
CART-TRACK
MASONRY WELL
NON-MASONRY WELL
WASTE LAND
IRRIGATED IN KHARIF
IRRIGATED IN RABI
UNIRRIGATED

FIG. 141

considerable number of masonry and non-masonry wells and ponds in the village plays an important role in the cultivation.

The rainfall was deficient in both the kharif and rabi seasons (Tables LXXII-LXXII). During the kharif season,1962, only 2.96 per cent of the total cultivated land was irrigated. Most of the cropped area is irrigated in the rabi season (Fig.141).

Only a few masonry wells are fitted with Persian wheels '<u>rahat</u>'. There are seven ponds[1] in the village. The '<u>charas</u>', '<u>dhekli</u>' and '<u>boke</u>' are generally used in irrigating from non-masonry wells and ponds. The underground water-table generally remains about 4 metres ~~down~~ below the surface in the cold weather season, 5 metres in the hot weather season and 3.5 metres in the season of rains. Some of the wells and most of the ponds dry up during the hot-weather season, and at times the underground water-table goes down to 6 metres below the surface.

LAND UTILIZATION

The cultivated fields and lands under other uses in the year 1962-63 are shown in Fig.142. The area of each use of land and its percentage to the total area of the village are given in Table CXX.

It will be seen from the Table CXX that the total cultivated area covers 93.98 per cent of the village, while other uses of land have only about 6 per cent. The fuel supply for household purposes from groves is inadequate, hence it is a general practice to burn dung-cakes as fuel. The fields are generally rectangular in shape; they are generally smaller in size in the good quality lands as compared to those in the medium quality lands.

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1. A pond is locally called as '<u>pokhar</u>' or '<u>talab</u>' or '<u>talao</u>'.

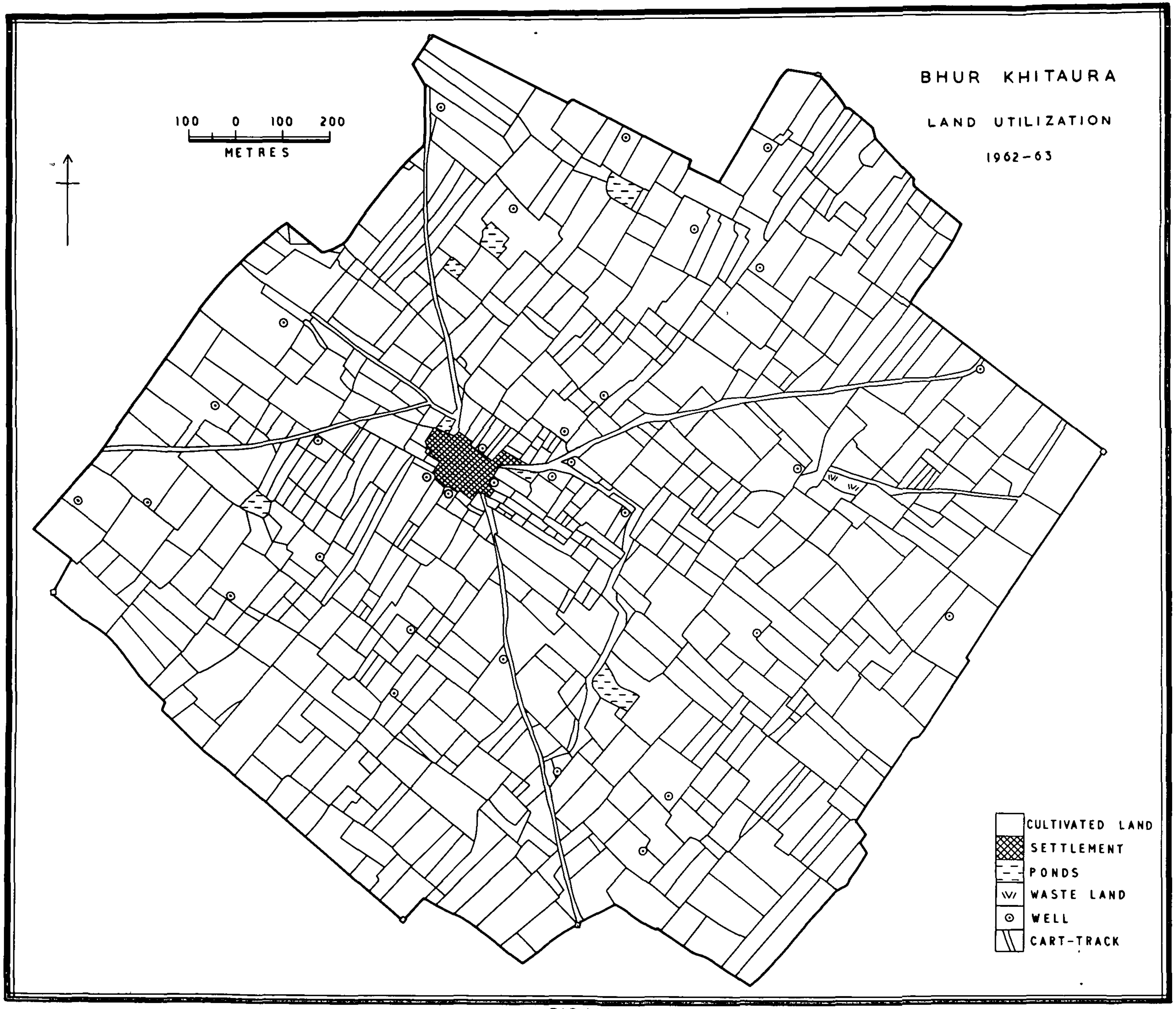
BHUR KHITAURA
LAND UTILIZATION
1962-63
100 0 100 200
METRES
CULTIVATED LAND
SETTLEMENT
PONDS
WASTE LAND
WELL
CART-TRACK

FIG.142

Table CXX

Total Area of the Village ... 740.125 acres

Use of land	Area in acres	Percentage to the total area
Cultivated land	695.597	93.98
Grove	18.375	2.48
Ponds	4.500	0.61
Settlement	3.591	0.49
Cart-track and road	10.656	1.44
Waste land	7.406	1.00
Total ...	740.125	100.00

LAND UTILIZATION IN THE KHARIF SEASON

The distribution of various crops grown in the kharif season,1962, and other uses of land are shown in Fig.143. Table CXXI gives the summary of the area occupied by each crop and its percentages to the total cultivated land and to the net cropped land.

Table CXXI shows that (37.49+14.51)= 52 per cent of the total area under cultivation is grown with the cereal and non-cereal crops in the kharif season and 48 per cent is under fallowing.

Among the grain crops, bulrush millet and pulses occupy the largest area, being 61.07 per cent of the net sown area in the season. All crops of millets and pulses (pigeon pea) occupy about 69 per cent of the net cropped area while rice and maize are the small crops, occupying only 2.8 per cent.

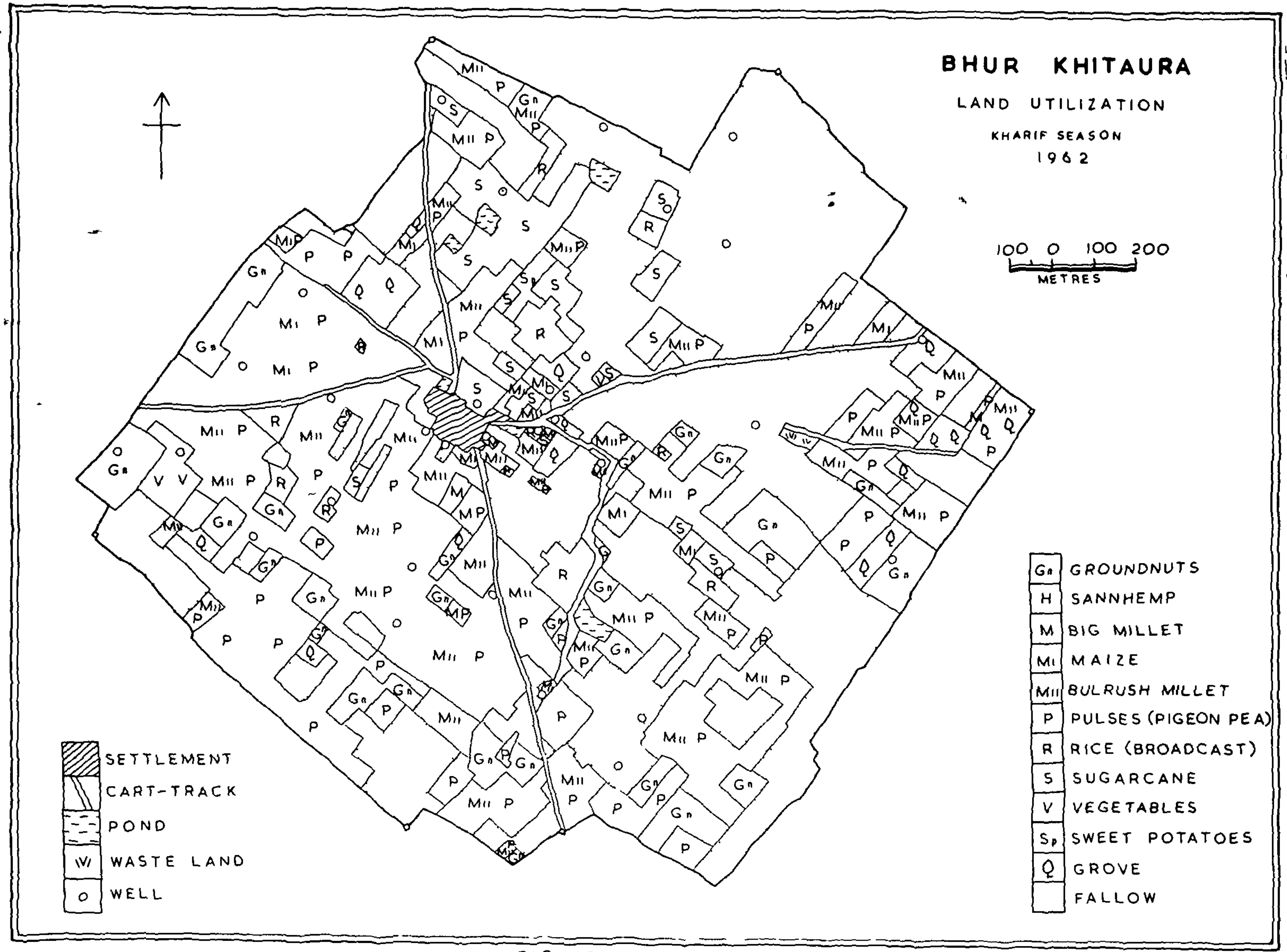
BHUR KHITAURA
LAND UTILIZATION
KHARIF SEASON
1962
100 0 100 200
METRES
Gn GROUNDNUTS
H SANNHEMP
M BIG MILLET
Mi MAIZE
Mii BULRUSH MILLET
P PULSES (PIGEON PEA)
R RICE (BROADCAST)
S SUGARCANE
V VEGETABLES
Sp SWEET POTATOES
Q GROVE
FALLOW
SETTLEMENT
CART-TRACK
POND
WASTE LAND
WELL

FIG 143

Table CXXI

Total Cultivated Land ... 695.597 acres

Net Cropped Land in the Kharif Season 361.688 acres

Crops	Area in acres	Percentage to the total cultivated land	Percentage to the net cropped land	Total percentage to the total cultivated land	Total percentage to the net cropped land
Grain Crops				37.49	72.09
Bulrush millet and pulses (pigeon pea)	220.906	31.76	61.07		
Pulses (urd[1] and moong)	16.750	2.41	4.63		
Bulrush millet	9.219	1.33	2.54		
Rice (broadcast)	7.062	1.01	1.95		
Maize	3.094	0.45	0.85		
Big millet and pulses	2.188	0.31	0.64		
Big millet	1.500	0.22	0.41		
Other Crops				14.51	27.91
Groundnut	51.063	7.34	14.12		
Fodder	28.719	4.13	7.94		
Sugarcane	20.625	2.96	5.70		
Vegetables	0.375	0.05	0.10		
Sweet potato	0.156	0.02	0.04		
Sannhemp	0.031	0.01	0.01		
Fallow	333.909	48.00		48.00	
Total ...	695.597	100.00	100.00	100.00	100.00

1. Black gram and green gram are known as 'urd' and 'moong'.

Among other crops, groundnut and fodder are the biggest crops, covering an area of 14.12 and 7.94 per cent of the net cropped land respectively. Sugarcane, vegetables, sweet potato and sannhemp are the smallest crops; '<u>chari</u>' and '<u>kulthi</u>' are main in fodder crops.

An area of about 334 acres remains under fallowing during the season. It covers 48 per cent of the total land under cultivation in the village. Large fallowing practice indicates general weakness of the soil of the lands under cultivation.

LAND UTILIZATION IN THE RABI SEASON

Agricultural and other uses of land in the <u>rabi</u> season, 1962-63, are shown in Fig.144. A summary of the area occupied by each crop and its percentages to the total cultivated land and to the net cropped area are given in Table CXXII.

It will be seen from the Table that 25.95 per cent under grain crops and 1.08 per cent under other crops is grown in the <u>rabi</u> season. About 38 per cent of the total cultivated area is under fallowing in the season, while about 35 per cent remains under continual kharif crops.

Among the grain crops, wheat and mixed crop of barley-peas occupy the biggest area; wheat-barley mixed crop also occupies a considerable proportion among various crops of the season. It is notable that barley, peas and gram are cropped in mixture. About 60 per cent of the net cropped land is occupied by mixed cropping.

Among other crops, only vegetables and potato are grown in the rabi which occupy a small area being 2.06 and 1.91 per cent of the net cropped area respectively.

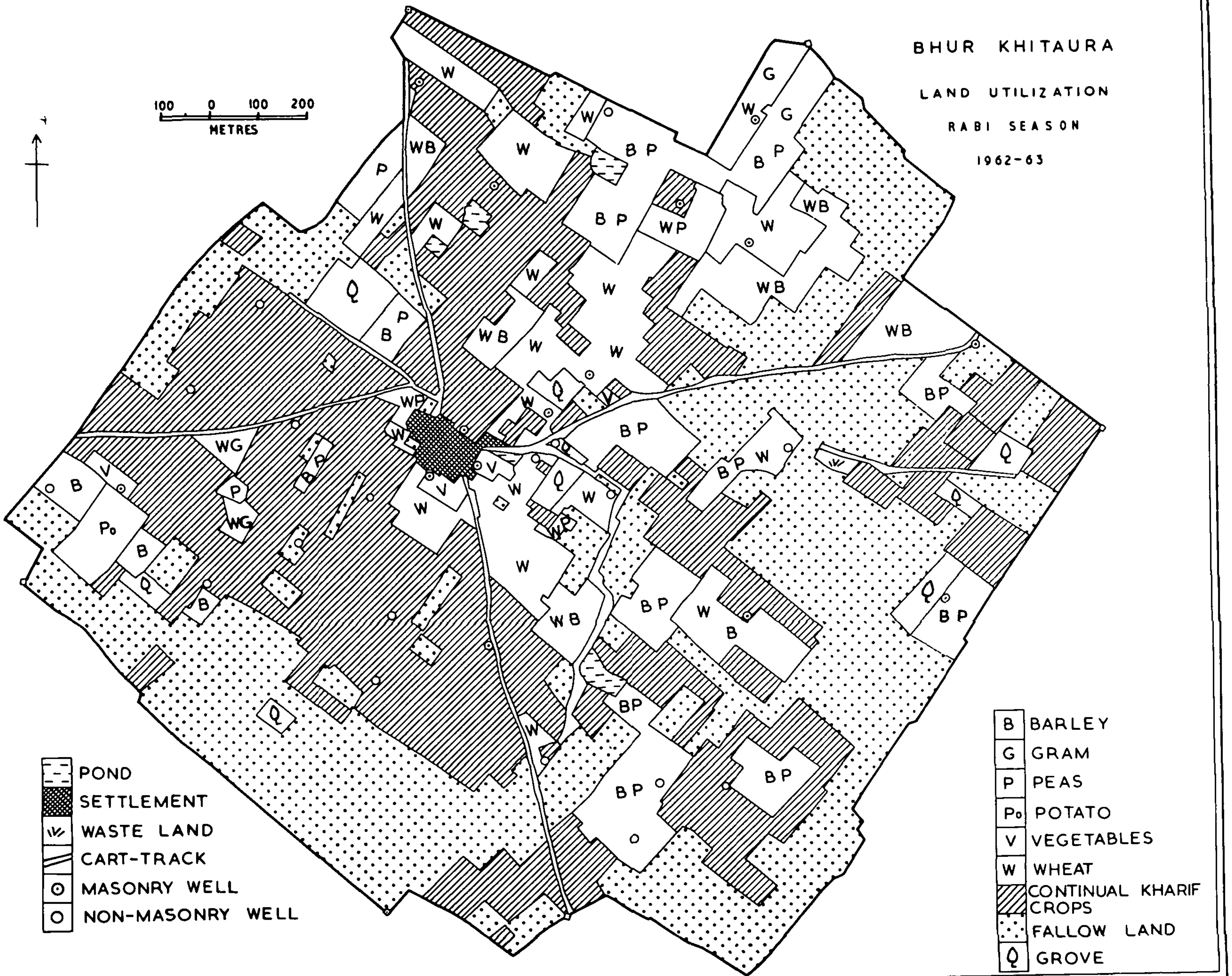
BHUR KHITAURA
LAND UTILIZATION
RABI SEASON
1962-63
100 0 100 200
METRES
POND
SETTLEMENT
WASTE LAND
CART-TRACK
MASONRY WELL
NON-MASONRY WELL
B BARLEY
G GRAM
P PEAS
Po POTATO
V VEGETABLES
W WHEAT
CONTINUAL KHARIF CROPS
FALLOW LAND
GROVE

FIG 144

Table CXXII

Total Cultivated Land ... 695.597 acres

Net Cropped Land in the Rabi Season 188.064 acres

Crops	Area in acres	Percentage to the total cultivated land	Percentage to the net cropped land	Total percentage to the total cultivated land	Total percentage to the net cropped land
<u>Grain Crops</u>				25.95	96.03
Wheat	58.750	8.44	31.25		
Barley-peas	48.250	6.94	25.65		
Wheat-barley	34.188	4.91	18.18		
Barley	9.563	1.38	5.08		
Wheat-gram	8.625	1.24	4.59		
Wheat-barley-peas	7.813	1.11	4.15		
Barley-peas-gram	7.375	1.06	3.92		
Wheat-peas	6.031	0.87	3.21		
<u>Other Crops</u>				1.08	3.97
Vegetables	3.875	0.56	2.06		
Potato	3.594	0.52	1.91		
<u>Fallow</u>	263.814	37.93		37.93	
Continual Kharif Crops	243.719	35.04		35.04	
Total ...	695.597	100.00	100.00	100.00	100.00

About 264 acres of the cultivated area remains under fallowing during the season. Moreover, about 244 acres of cultivated land remain under continual crops which include about 223 acres of arhar (pigeon pea) and 20.625 acres of sugarcane.

DOUBLE CROPPED LAND

The fields cropped twice, in the kharif as well as in the rabi seasons of 1962-63, have been shown in Fig. 145. The area under double cropping is 43.625 acres which is only 6.3 per cent of the whole area under cultivation in the village.

Double cropping is very little owing to weakness of the soil in general. The double cropped area possesses good quality (A) land. The area under double cropping may have little change from year to year in accordance with increase or decrease of manuring and irrigation applied to the land. The crops of maize, millets, rice and groundnut are replaced by wheat, barley-peas, wheat-peas and wheat-gram (mixed), though these crops are grown also in the medium quality (B) lands. The double cropped area per head of population is 0.133 acre.

ROTATION OF CROPS

There are no hard and fast rules to be adopted for rotation of crops in the village. The increase or decrease in provisions of manuring and irrigation does also affect upon choice of a crop; fluctuations of rainfall have also some effects upon rotation of crops. The following rotations are generally followed:

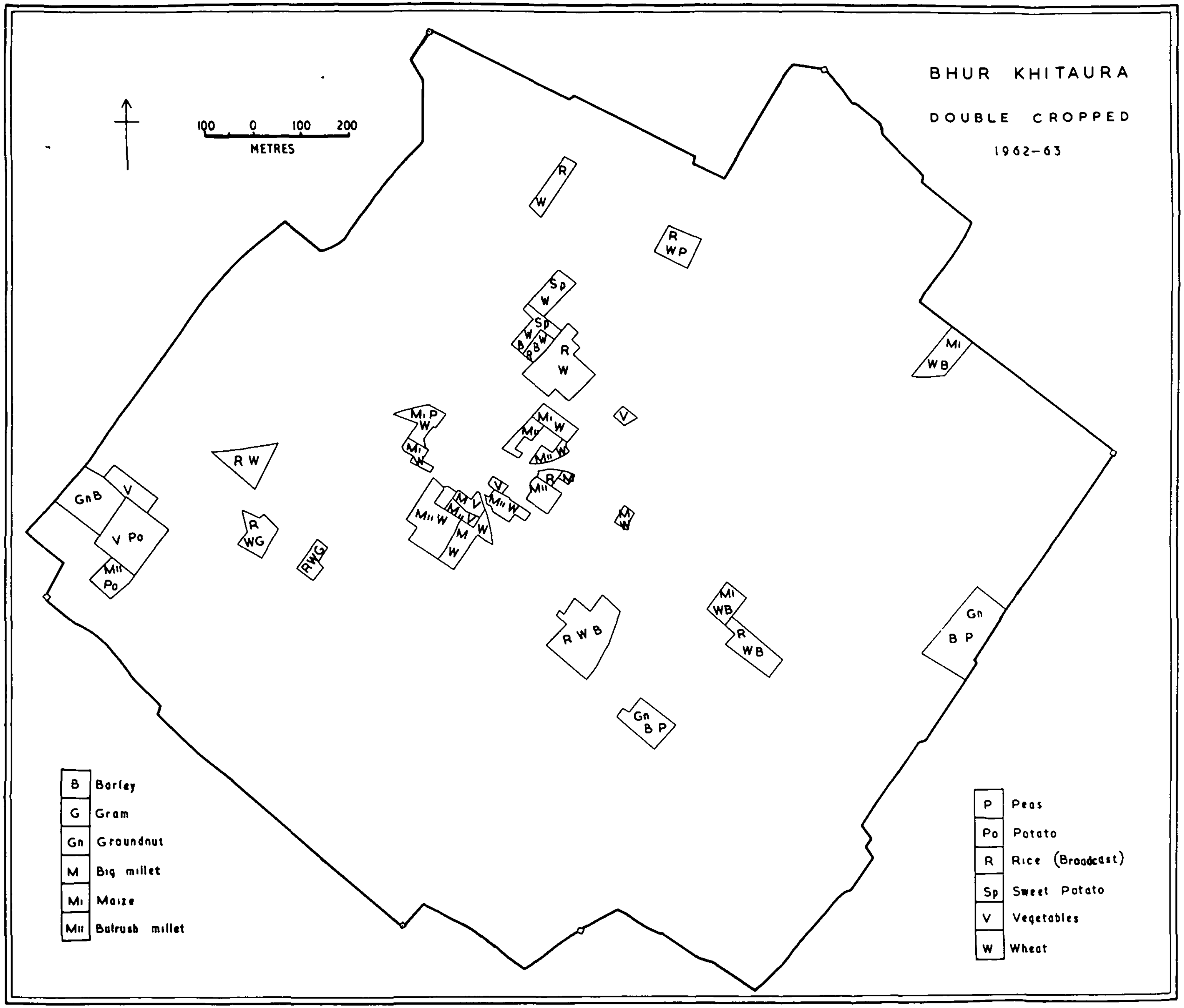
BHUR KHITAURA
DOUBLE CROPPED
1962–63
100 0 100 200
METRES
B Barley
G Gram
Gn Groundnut
M Big millet
Mi Maize
Mii Bulrush millet
P Peas
Po Potato
R Rice (Broadcast)
Sp Sweet Potato
V Vegetables
W Wheat

FIG.145

Crop year	Kharif Season	Rabi Season
First year	Millets/maize/sugarcane	Barley-peas/wheat/sugarcane (contd.)
Second year	Groundnut/rice	Wheat/wheat-gram
Third year	Millet/pulses (<u>urd</u>, <u>moong</u>)/groundnut	Wheat-barley/wheat-peas-barley/barley-peas-gram

The above practice of crop rotations relates to the good quality (A) lands. But the rotations in the medium quality (B) lands are different:

Crop year	either in Kharif Season	or in the Rabi Season
First year	Millets/maize/groundnut	Barley-peas/wheat-barley
Second year	Millets with pulses(<u>arhar</u>-pigeon pea)/fodder	(kharif pulses (<u>arhar</u>) contd.)/wheat-peas-barley/potato
Third year	Millets with pulses(<u>arhar</u>)/<u>urd</u>/<u>moong</u> pulses	'<u>arhar</u>' (contd.)/wheat-barley/wheat-peas-barley/barley-peas-gram/potato

The medium quality (B) lands are cropped in either the kharif season or the rabi season and they are left fallow during the other season. A considerable proportion of the B quality lands is put under fallowing for two or three continuous seasons for recuperation of fertility; the area of such lands during 1962-63 is 189.470 acres or about 27 per cent of the whole area under cultivation in the village. Groundnut, millets and pulses dominate when B quality lands are cropped in the kharif season. Mixed cropping is usual in the rabi season in these lands.

Sugarcane, grown in the A quality lands, does not generally continue for more than one year unlike the usual practice in the villages of loamy and sandy loam soil tracts. After harvest of groundnut, its plant is generally used as green manure which proves very useful for a crop in the rabi season.

LAND USE AND POPULATION

Total population of village Bhur Chitaura is 328. The total area and the per capita share in the total cultivated land, net cropped land in the kharif season, as well as in the rabi season, gross cultivated land and the double cropped land are given in Table CXVIII.

Table CXVIII

Total Population of the Village ... 328
(Area in acres)

	Total area of the village	Total land available for cultivation[1]	Net cropped land in the kharif season	Net cropped land in the rabi season	Gross cultivated land (of both kharif and rabi season)	Double cropped land
	740.125	695.597	361.688	188.064	549.752	43.625
Land per head of population	2.256	2.121	1.103	0.573	1.676	0.133

The Table shows that the per capita share in the total area of the village is 2.256 acres while per capita land available for cultivation is 2.121 acres. Owing to large fallowing during the kharif season, the per capita

1. The total land available for cultivation includes also 189.47 acres of agricultural land which is under fallowing for the two or more seasons.

share reduces to 1.103 acres of the net cropped land in the kharif season. The per capita share further reduces to 0.573 acre of the net cropped land in the rabi season.

The gross cultivated area, however, gives a share of 1.676 acres per head of population; actual amount of land which supported one person in village Thur Khiraura is this 1.676 acres. The per capita share of double cropped land in the village is 0.133 acre.

Out of the total population, 91 per cent are cultivators or primary rural in the village, while the rest are secondary rural being dependent upon the cultivating class through their subsidiary services, they include tailors, carpenter, ironsmith and shopkeepers.

CALORIC INTAKE

The yield rates of various crops grown in the kharif and rabi seasons are given in Table CXXIV.'A'. The yield in A quality lands is better than in B quality lands. However, yield rates are generally very low as compared to those in villages of other soil-types.

On account of low rates of yields, the less output of crops as compared to the large acreage under cultivation in the village has resulted in inadequate quantitative consumption per head per day.

It will be seen from Table CXXIV-B that, with an intake of 1865 calories per head per day, the villagers suffer from under-nutrition. The large intake of calories is in order from bulrush millet, pulses, sugar (gur), wheat, barley-peas and wheat-barley. As a result, the deficiencies of fat, protein, calcium and vitamins A and C occur in the diet, in addition to under-nutrition. Therefore the diseases of nutritional deficiencies are found in the village.

Table CXXIV-A

Yields of Crops in Village Thur Khitaura, 1962-63

Crops	Yield per acre (in kilograms)
Bulrush millet (when sown with pulses)	86
Big millet (when sown with pulses)	84
Pulses (arhar-pigeon pea, when sown with millets)	70
Pulses (sown alone)	112
Bulrush millet	167
Rice (broadcast, unhusked	221
Maize	168
Big millet (sown alone)	140
Canesugar (gur)	765
Sweet potato	**1,866**
Wheat	207
Barley	215
Barley-peas	215
Wheat-peas	214
Wheat-peas-barley	212
Wheat-gram	161
Barley-peas-gram	182
Potato	**1,866**

Table CXXIV B

FOOD BALANCE SHEET

VILLAGE BHUR KHITAURA

(in kilograms)

Population... 328 Year 1962-63

Commodity	Production	Total Production	Export	Import	Available Supply	Seed	Feed (Gross)	Extraction rate per cent	Feed (net)	Per head Consumption: Kilograms per year	Grams per day	Calories per day
Bulrush millets (sown with pulses)	20544.3	22093.1	1841.1	-	20252.0	670.2	19581.7	95	18602.7	56.716	155.4	540.8
Bulrush millet (sown alone)	1548.8											
Rice (broadcast)	1560.7	1560.7	-	-	1560.7	177.9	1382.8	66 2/3	921.9	2.811	7.7	27.5
Maize	519.8	519.8	-	-	519.8	23.0	496.8	89	442.2	1.342	3.6	12.8
Big millet (sown with pulses)	183.8	435.8	-	-	435.8	14.5	421.3	95	400.2	1.220	3.3	11.3
Big millet (sown alone)	252.0											
Pulses (sown with millets)	15616.6	17492.6	5247.8	-	12244.8	359.2	11885.6	95	11291.3	34.424	94.3	323.4
Pulses (sown alone)	1876.0											
Sugar (gur)	15778.1	15778.1	5324.0	-	10454.1	1546.9	8907.2		8907.2	27.156	74.4	261.1
Sweet potato	291.1	291.1	-	132.9	524.0	-	524.0	83	434.9	1.326	3.6	3.5
Wheat	12161.3	12161.3	-	-	12161.3	2820.0	9341.3	90	8407.2	25.632	70.2	234.5
Barley-peas	10373.8	10373.8	-	-	10373.8	2412.5	7961.3	82	6228.3	18.988	52.0	176.5
Wheat-barley	7111.1	7111.1	-	-	7111.1	1658.1	5453.0	80	4362.4	13.300	36.4	121.2
Barley	2008.2	2008.2	-	-	2008.2	468.6	1539.6	70	1077.7	3.285	9.0	29.9
Wheat-gram	1388.6	1388.6	-	-	1388.6	426.6	962.0	92	885.0	2.698	7.4	25.6
Wheat-peas-barley	1656.4	1656.4	-	-	1656.4	382.8	1273.6	85	1082.6	3.301	9.0	30.4
Barley-peas-gram	1342.3	1342.3	-	-	1342.3	368.8	973.5	86 2/3	843.7	2.572	7.0	24.2
Wheat-peas	1290.6	1290.6	-	-	1290.6	298.5	992.1	92	912.7	2.783	7.6	25.8
Potato	6706.4	6706.4	2951.4	-	3755.0	467.2	3287.8	85	2794.6	8.520	23.3	16.3
Total												1864.6

POTENTIAL PRODUCTION UNIT

On the basis of the yield of crops in the village, the potential productivity of different types of productive and unproductive lands in the village has been ascertained. Table CXXV gives the relative productivity ratings of each of them, and the total number of Potential Production Units has been worked out.

Table CXXV

Average Yield per acre of Normal Standard Farmland in the Village: 200 kilograms or 1 P.P.U.

Type of land	Area in acres	Average yield in kilograms	Productivity rating per acre	Number of P.P.U.
A	64.250	352	1.76	113.080
B	631.347	200	1.00	631.347
C	7.406	0	0	0
Total ...	703.003			744.427

It will be seen from the Table that the total Potential Production Units of the village are larger than the total productive and unproductive lands. It is because a very small amount of the poor (C) quality lands, about 7 acres, as against about 696 acres of productive lands of which about 9 per cent (A quality lands) possesses a high productivity rating, being 1.76 P.P.U. per acre.

The medium quality (D) lands, being about 91 per cent of the total land under cultivation, are equal to 1 P.P.U. per acre, hence they provide the largest number of P.P.U. to the total.

If, however, the facilities for irrigation and manuring are sufficiently extended to the medium quality lands, the productive value of a considerable proportion of them may well be increased.

The inadequacy of manuring and irrigation facilities, on the one hand, and the (bhur) sandy texture of the soil, on the other, have played a considerable role in lessening the average yield of crops.

CHAPTER XII

NUTRITIONAL DEFICIENCY DISEASES

In the previous chapters an attempt has been made to assess the caloric intake of the villagers and it has been observed that wherever the intake is below 2000 calories per head per day, the health of the villagers is poor and the people suffer from various diseases. As there is a correlation between inadequate and unbalanced nutrition and diseases, an attempt has been made to study the nutritional deficiency diseases at the village level in the area.

A very low percentage of village population has recently become well-to-do. However, the dietary habits of most of them have largely remained unchanged. Though the diet of the common villagers remains adequate for the most part but an adequate diet does not, of course, insure adequate nutrition'.[1] Therefore the nutritional deficiency of one or more nutrient s is possible. Nevertheless, the poor class is much liable to suffer from low quality and insufficient quantity of food, as found in most of the villages of medium quality lands. The ' patients are mostly from the poor classes of people living on diets that are both qualitatively and quantitatively inadequate'.[2]

The nasty smell from cattle-dung and urine inside the residential compounds, the stinking manure-pits being very close to homes in the villages and numerous heeps of dung-cakes in the village are in addition

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1. Corwin, E.H.L., Ecology of Health , (New York, 1949), p. 55
2. May, J.M., The Ecology of Malnutrition in the Far and Near East, (New York, 1961), p. 227.

to bad conditions of sanitation with filthy unmetalled streets and lanes, bad drainage— particularly in the rainy season — , no removal of sewage and no prevention of disease. These drawbacks are usually found in almost all villages; and thus there is none in the selected villages which may be regarded as safe from diseases. There are some diseases, born due to non-nutritional causes, but they are increased by nutritional deficiencies. Thus unhygienic conditions and other causes interplay with nutritional deficiencies in the growth of many diseases.

MORBIDITY AND MORTALITY

However, chronic malnutrition among many of the people results from the inadequate diets[1] in combination with a depressing complex of low standards of material life and health, poor nutrition, and liability to diseases of poverty, backwardness and ignorance[2]. The mortality is the bare outcome of the final serious physical breakdown from a disease while morbidity is slowly progressive and takes time to develop symptoms. Fig. 146 shows[3] a larger percentage of morbidity from deficiency diseases than mortality in every village. The morbidity varies from 3.9 per cent of the village population to 7.9 per cent, while the mortality varies from zero to 0.8 per cent, as is shown in the table CXXVI.

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1. Learmonth, A.T.A., Medical Geography in Indo-Pakistan, The Indian Geographical Journal, Vol. XXXIII, No. 1 & 2 (Madras, Jan.- June, 1958), p. 49
2. ibid., p. 50
3. The writer conducted the field work in the selected villages during 1962-63; the Figs. 146 to 161 and tables CXX VI to CXLII are based on this field work; every house of the selected villages has been visited and statistically ~~all informations have been taken.~~
[illegible] has been [illegible] [illegible] apart.

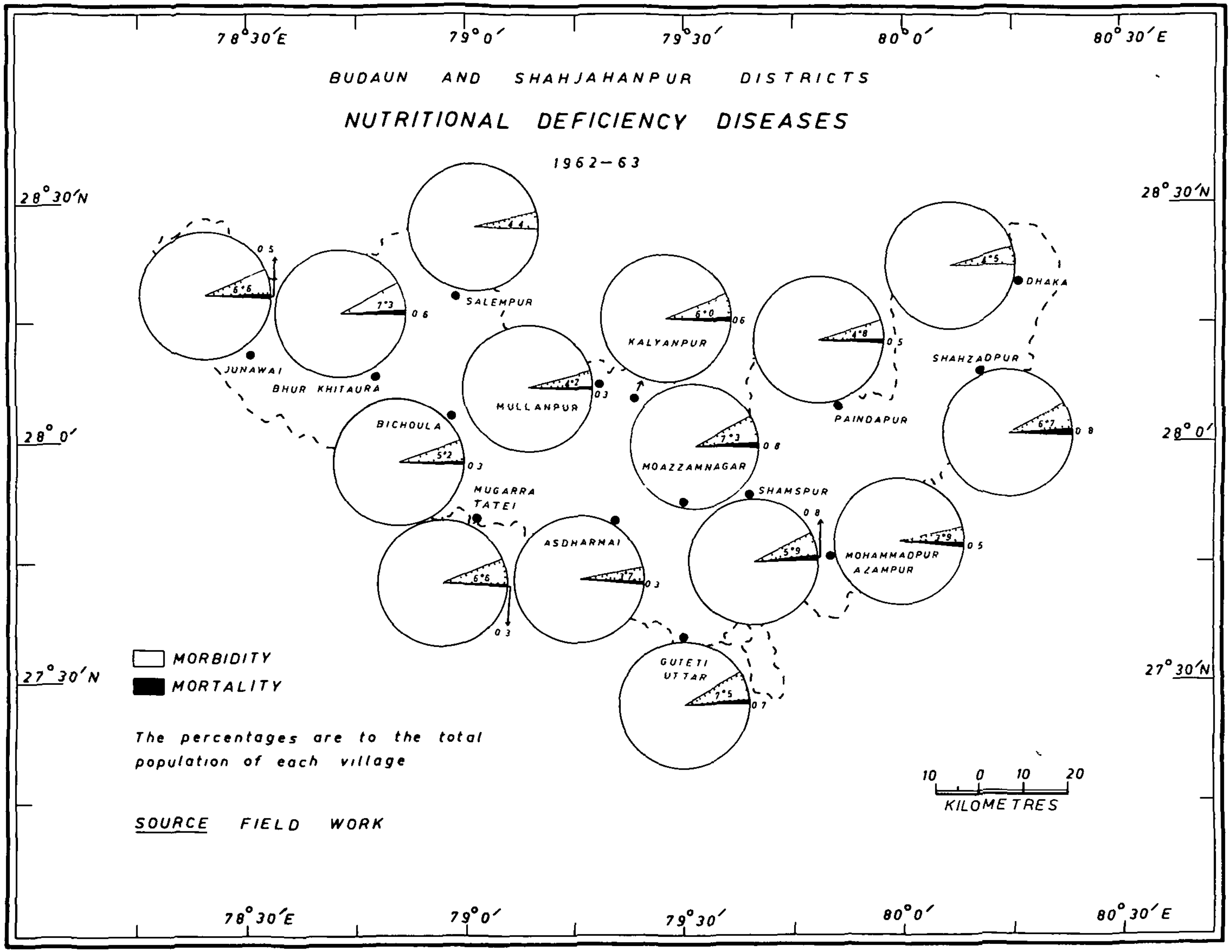
BUDAUN AND SHAHJAHANPUR DISTRICTS
NUTRITIONAL DEFICIENCY DISEASES
1962–63
78°30′E
79°0′
79°30′
80°0′
80°30′E
28°30′N
28°0′
27°30′N
JUNAWAI
BHUR KHITAURA
SALEMPUR
BICHOULA
MULLANPUR
MUGARRA TATEI
ASDHARNAI
KALYANPUR
MOAZZAMNAGAR
SHAMSPUR
GUTETI UTTAR
PAINDAPUR
DHAKA
SHAHZADPUR
MOHAMMADPUR AZAMPUR
MORBIDITY
MORTALITY
The percentages are to the total population of each village
SOURCE FIELD WORK
10 0 10 20
KILOMETRES

FIG 146

TABLE CXXVI

Percentage of Morbidity and Mortality to the total population of the village

Village	Caloric intake per head per day	Percentage of morbidity	Percentage of mortality	Soil type of the village
Salempur	2261	5.2	0	loamy soil
Mullanpur	2217	4.5	0.3	
Asdharmai	2138	3.9	0.3	
Paindapur	2167	4.8	0.5	
Mohammadpur Azampur	2235	3.9	0.5	
Dhaka	2259	4.2	0	
Junawai	1960	6.2	0.5	sandy loam
Bichoula	1975	5.2	0.3	
Shamspur	2057	5.9	0.8	
Kalyanpur	1977	6.0	0.6	clayey loam
Moazzamnagar	2057	7.3	0.8	
Mugarra Tatei	1965	6.6	0.3	khadar (sandy soil)
Guteti Uttar	1973	7.5	0.7	
Shahzadpur	1948	6.7	0.8	
Bhur Khitaura	1865	7.9	0.6	bhur (sandy soil)

source: Field Work

Villages of large and enough calorific supply of food per head per day have malnutrition and are not free from deficiency diseases. For instance, Salempur, Dhaka, Mohammadpur Azampur and Mullanpur, the villages of highest calorific supply of food in the area, have 3.9 to 5.2 per cent of the village populations suffering from deficiency diseases and the diseases increased by nutritional deficiencies. Moreover, 0 to 0.5 per cent of the population has died of these diseases. The signs of deficiency ailments are found both in male, female and children. But the poor section of the people, which is predominant, is subject to both undernutrition and malnutrition for a long time, which have ultimately resulted in various deficiency diseases. The field work of the author reveals that under-nutrition in the people is not so serious as the malnutrition, and this is a more dangerous phenomenon of health affairs of hard working rural population. The diets of poor nutritional quality are directly responsible for the occurrence of specific deficiency diseases.[1]

Of the specific deficiency diseases, the vitaminosis deficiency state and deficiency of nutrients and minerals vary from place to place in accordance with the varying production and varying consumption of food-grains and other foodstuffs. The deficiency of fats, carbohydrates, vitamins A and C and calcium exists in almost all types of villages and deficiency of protien is also found in many villages, yet their degree of deficiency vary from one village to another. The local environment and peculiarities under dusty climate, dirty streets and dung-heap custom do partly influence the occurrence of different diseases and help to develop the deficiency diseases.

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1. Sukhatme, P.V.- Feeding Indias Growing Millions, (Bombay , 1965)p.57

The lack of a particular or many essential nutrients in a long- ~~the prolo~~nged defective dietetic system is certain to make a considerable proportion ~~percentage~~ of people more prone to deficiency diseases. Bad growth of teeth, bones or skin, stunted growth in children, poor physique of adults, dullness and debility, lack of initiative, nutritional anaemia, intestinal or abdominal disorders and weak-resistence to diseases and numerous other ailments are all expression of neglected ~~uncared~~ malnutrition.

The seasonal and climatic variations as well as endemic peculiarities have a direct control on the morbidity. Intestinal infection mostly in the hot and rainy season, disturbed digestion in the rainy season, eye-diseases and epistaxis in the hot season, and the secondary anaemia, particularly in the hot dry areas are effective on health. Extremes of heat and cold are definitely harmful , and even moderately hot conditions increase suscep-tibility to intestinal diseases, and moderately cold conditions increase susceptibility to respiratory diseases[1]. The hot dry season and the wet monsoon season are more inclined to morbid conditions than the winter season, except for ~~the~~ respiratory diseases. The incidence ~~diseases~~ of gastritis, anorexia, constipation, indefinite stomach-distress, colitis and flatulence are low ~~do not exist~~ in winter season. It means the stomach and intestines have better resistance to diseases in winter than in the rest of the year. The re-opening of old wounds, scabies and inflammation occur mostly in the rainy season.

A person who lives on a general dietary deficiency for a period of years, even though he may not develop chronic respiratory infections, or

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1. Winslow, C.E.A., & Herrington, L.P., Temperature and Human Life, (Princeton, 1949), p. 255.

actual peptic ulcer, will have vague, indefinite stomach distress, indigestion, some degree of constipation or abnormal colon[1]. The functions of various nutrients are different and necessary. To supply energy for muscle- and other tissue-function which goes on all the time and to ensure a supply of all the nutrients as vitamins and minerals needed to regulate and control the complicate metabolic processes of the body, the effects of all vitamins overlap and interlace to such a degree that no disease is caused by any single vitamin deficiency.[2] Every village having various deficiency-diseases has deficiencies of numerous nutrients, and in varying degree.

A comparison of Figs. 147 to 161 and Table CXXVI shows that the villages of loam soil tracts, possessing the highest standard of calorific supply of daily food, have generally a lower rate of morbidity and mortality resulting from deficiency-diseases as compared to the rest of the villages of sandy, sandy loam or clayey loam tracts. The morbidity varies between 3.9 and 5.2 per cent of the population in the villages consisting of loamy soil whereas it varies between 5.2 and 7.9 per cent in other villages. Similarly the mortality rate due to such diseases show the same phenomenon : it is zero to 0.5 per cent of the total population in the villages of loamy soil while it varies from 0.3 to 0.8 per cent in villages of other soil types.

It may, therefore, follow that in general the better the fertility and quality of the soil, the lower would be the rates of morbidity and mortality from malnutrition or deficiency diseases in their population, and vice versa.

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1. Quigley, D.T.- The National Malnutrition, (Milwaukee, Wisconsin, 1959), p. 43
2. ibid. p.36

There are only two out of six villages of good quality land which have their highest percentage of morbidity as 5.2, while, on the other hand, all the villages of medium quality soils have almost 6 per cent and above. The highest morbidity (7.3 to 7.9 per cent) is found in villages Guteti Uttar(Khadar- sandy soil), Bhur Khitaura (Bhur sandy soil) and Moazzamnagar (clayey loam soil). Each of the soil types of sandy loam, clayey loam and khadar sandy soil has at least one village which has 0.8 per cent mortality. Moreover, the lands of second grade or medium soils are more susceptible to mortality from the malnutrition and deficiency diseases.

The water-pollution, the air-pollution, poor housing and bad hygienic conditions and deficiency of important nutrient elements in the diet as vitamins, minerals and protein —— particularly animal protein — have played a great role in producing several diseases in the villages.

The animal proteins are superior to vegetable-proteins. ~~It~~ the is ' mainly due to the presence of the essential amino-acids (especially methionine, tryptophan, and lysine) in larger amounts and also in better balanced proportions[1]'. The discarding off of the bran from wheat or other grain-flour and from lentil s or rice ~~is to be deprived of~~ causes loss of iron, vitamin B1 and some other nutrients. Like unrefined sugar (gur or cane-juice), the energy rich foods with little proteins, minerals or vitamins, too often predominate in the dietary pattern.[2]

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1. Kuppuswamy, S., Srinivasan, M, and Subrahmanyan, V.— Proteins in Foods , Indian Council of Medical Research (New Delhi, 1958),p.4.
2. Proudfit, F.T. — Normal and Therapeutic Nutrition,(Calcutta, 1965). p. 368

The air-pollution is accompanied with water pollution. Most part of rural population live near ponds or rivers and the banks are used for defaecation without the existence of latrines, their water is also used for washing of clothes including those of cholera patients[1] and the patients of small-pox, tuberculosis, measles and scabies, etc. ' The rural population remains as yet highly susceptible to the tuberculosis diseases[2] and at times, to other infectious diseases which are increased by nutritional deficiencies, like small-pox and dysentery.

CROPS AND NUTRITIONAL DEFICIENCY DISEASES

There is a fundamental relation in between the crops produced in the villages and the nutritional deficiency diseases therein. Every cereal has different nutritional values which determine the health conditions after prolonged consumption. ' Rice lands, millet lands and wheat lands are represented in the area of lighter death-rates in the northern plain[3]'. —— This statement is confirmed by the low percentages of mortality due to the total diseases related with nutritional deficiencies, in villages of each type of soils.

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1. Learmonth, A.T.A., op.cit., p. 30
2. ibid, p. 26
3. ibid, p. 37

THE NUTRITION BALANCE

The villagers are predominantly vegetarians and their main diet consists of cereals, pulses, starchy roots and sugar. Cereals , however, make already a very large contribution to the energy value of the diet and also to the protien content, as compared to starchy roots and sugar, while the starchy roots, having low protien content, are valuable source of vitamins and minerals, and sugar, ~~having~~ source of energy in readily assimilable form, has no nutritional ~~appeal~~ merit.[1]

It will be seen from Tables CXXVIII to CXL II[2] that in every village the diet of the people is mainly dependent upon the cereals of the kharif and the rabi seasons. The villages of loamy soil tract in the Budaun district produce a large amount of millets and pulses and a fair amount of sugar in the kharif season and wheat and gram in the rabi season. But the villages of the same soil type in Shahjahanpur district have rice, sugar (gur) , wheat and gram as the staple food.

The per capita daily amount of diets in the villages of sandy loam soil, Junawai, Bichouli and Shamspur, consists of maize, millets, pulses wheat and barley. Sugar (gur) is also an important item in the diet. The villages of clayey loam soil, Kalyanpur and Moazzamnagar , take rice and millets and considerably sugar, wheat and gram as larger amount of their diets than other foodstuffs.

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1. Sukhatme, P.V., op.,cit., p. 96
2. The Tables CXXVIII to CXLII have been computed by the writer for all selected villages on the basis of the nutritive values of Indian foods given by Aykroyd, W.R.— The Nutritive Value of Indian Foods and the planning of Satisfactory Diets, revised by Gopalan, C. and Balasubramanian, S.C... Indian Council of Medical Research (New Delhi, 1963), pp. 49-118

The villages of khadar sandy soil, Mugarra Tatei, Guteti Uttar and Shahzadpur, consume large amount of sweet potato, rice, sugar, maize, wheat and barley; while in the village of bhur sandy soil, Bhur Khitaura, millets, pulses, sugar (gur) and wheat form a major part of the diet of the people.

Table CXXVII shows the standard requirmments of nutrients in the daily diets according to various assessments:

TABLE CXXVII

Prposed Indian Standard Requirements of Nutrients in daily diet

Proposed Standards	Protein (gram)	Carbo-hydrates (gram)	Fat (gram)	Vitamin A I.U.	Thia-mine (B_1) (mg.)	Ribo-flavin (B_2) (mg.)	Nia-cin (nico-tinic acid) (mg.)	Ascor-bic acid (c) (mg.)	Cal-cium (mg.)	Phos-pho-rus (mg.)	Iron (mg.)
I[1]	85	605	60								
II[2]	70			5,000	1.5	1.6	14	50	800	960	15
III[3]	69			4,750	1.3	1.4	13	49	950	1140	17
IV[4]	70	440	50	7,300	1.8			200	800	1400	40

1. Radhakamal Mukerjee: Food Planning for Four Hundred Millions, (London, 1938), pp.73 and 78
2. Swaminathan, M and Bhagawan, R.K.: Our Food (Madras, 1962), p. 62
3. The averages of all types of persons mentioned by Swaminathan and Bhagawan, ibid., pp. 62-63
4. Aykroyd, W.R., op., cit., p. 33.

THE DEFICIENT NUTRIENT ELEMENTS AND THE NUTRITIONAL DEFICIENCY DISEASES

Among the villages of the good quality land, the village of Salempur has the diet lacking in mostly vitamin A, ascorbic acid (vitamin C), fat, calcium, carbohydrates and partly proteins and riboflavin. The greatest deficiencies being of the vitamins A and C, vary as judged by three standards of nutrient requirements; the last standard balance shows the most remarkable deficiencies of the two vitamins. Other nutrient elements like thiamine, niacin (nicotinic acid), phosphorus and iron are sufficiently present in the diet. The deficiencies of 6378.5 I.U. of vitamin A, of 198 mg. of ascorbic acid, of 35.9 gm. of fat, of 138.8 gm. of carbohydrate, of 449.7 mg. of calcium are very alarming in the village dietary standard, as shown in Table CXXVIII.

Fig. 146 shows that the village, during the year 1962-63, has had 5.2 per cent of the population suffering from numerous deficiency ailments, but none died owing to deficiency diseases. The major diseases found in the villag are scabies, night-blindness, keratomalacia, xerophthalmia, dental caries, follicular keratosis of skin and slow healing of wounds. Scabies is present in adults as well as in child. One case in each of breathlessness, dyspepsia general weakness, osteomalacia and rheumatism is found in adults, and low-birth-weight, stunted growth and vomiting in children. The adults suffer more from nutritional deficiencies than children, as is evident from Fig. 147. The children, as compared to adult males and females, are less susceptible to nutritional deficiency diseases in the village.

TABLE CXXVIII

NUTRITION BALANCE SHEET

Village Salempur

Cereals	Consumption per head per day in grams	Protein gm.	Carbohydrate gm.	Fat gm.	Vitamin A I.U.	Thiamine (Vitamin B1) mg.	Riboflavin (Vitamin B2) mg.	Niacin mg.	Ascorbic acid (Vitamin C) mg.	Calcium mg.	Phosphorus mg.	Iron mg.
Bulrush millet	90.0	10.4	60.8	4.5	198.0	0.29	0.14	2.9	0	37.8	242.1	12.9
Bulrush millet and big millet	8.8	1.0	6.2	0.3	13.2	.03	Q02	0.2	0	2.9	21.6	0.9
Bulrush millet and maize	2.6	0.3	1.7	0.1	22.4	0	0	0.1	0	0.7	8.0	0.2
Rice (broadcast)	40.5	3.0	34.1	0.4	0	.09	.06	1.6	0	4.9	70.9	1.2
Rice (transplanted)	31.4	2.1	24.6	0.2	0	.03	.01	0.6	0	3.1	50.2	0.9
Maize	21.7	2.4	14.4	0.8	325.9	.09	.02	0.3	0	2.0	75.5	0.4
Big millet	2.9	0.3	2.1	0.1	2.3	.01	.01	0.1	0	0.7	6.4	0.2
Small millet	2.2	0.1	1.4	0	0	0	0	0.1	0	0.4	6.1	0.1
Pulses	22.3	4.9	12.8	0.4	49.1	.10	.11	0.6	0	16.3	67.8	1.3
Sugar (gur)	77.8	0.2	76.4	0.1	0	0	0	0	0	21.8	3.1	0
Wheat	81.7	9.9	56.7	1.4	40.0	.40	.24	3.5	0	39.2	345.6	9.4
Wheat-gram	45.5	6.6	29.6	1.6	83.0	.18	.18	1.5	0.7	56.9	167.2	4.9
Wheat-barley	44.1	5.2	30.6	0.7	14.6	0.21	.11	2.2	0	16.3	140.7	3.2
Barley-peas	75.1	11.7	47.3	0.9	31.2	0.35	.22	2.7	0	37.9	192.6	3.1
Peas -gram	44.4	8.2	26.1	1.4	84.8	.17	.19	0.9	0.7	61.5	135.4	3.4
Wheat-barley-peas	27.4	3.9	17.9	0.4	12.1	.13	.08	1.1	0	13.6	85.5	1.8
Barley-peas-gram	12.4	1.9	7.7	0.3	16.5	.05	.04	0.4	0.1	12.5	34.1	0.8
Barley-gram	9.9	1.4	6.5	0.3	16.5	.04	.03	0.4	0.1	11.3	26.1	0.7
Wheat-peas	6.8	1.1	4.3	0.1	3.9	.03	.02	0.2	0	4.2	24.5	0.6
Wheat-gram-peas	5.3	0.9	3.3	0.1	7.6	.02	.02	0.1	0.1	5.7	18.2	0.5
Barley	2.4	0.3	1.7	0	0.4	0	0	0.1	0	0.6	5.2	0.1
Total		75.8	466.2	14.1	921.5	2.22	1.50	19.6	1.7	350.3	1726.8	46.7
Deficiencies		grams	grams	grams	I.U.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
By Standard I		9.2	138.8	45.9								
Standard II		-	-	-	4078.5	-	0.10	-	48.3	449.7	-	-
Standard III		-	-	-	3828.5	-	-	-	47.3	599.7	-	-
Standard IV		-	-	35.9	6378.5	-	-	-	198.3	449.7	-	-

NUTRITIONAL DEFICIENCY DISEASES

1962-63

THE PERCENTAGES ARE TO THE TOTAL POPULATION OF EACH VILLAGE

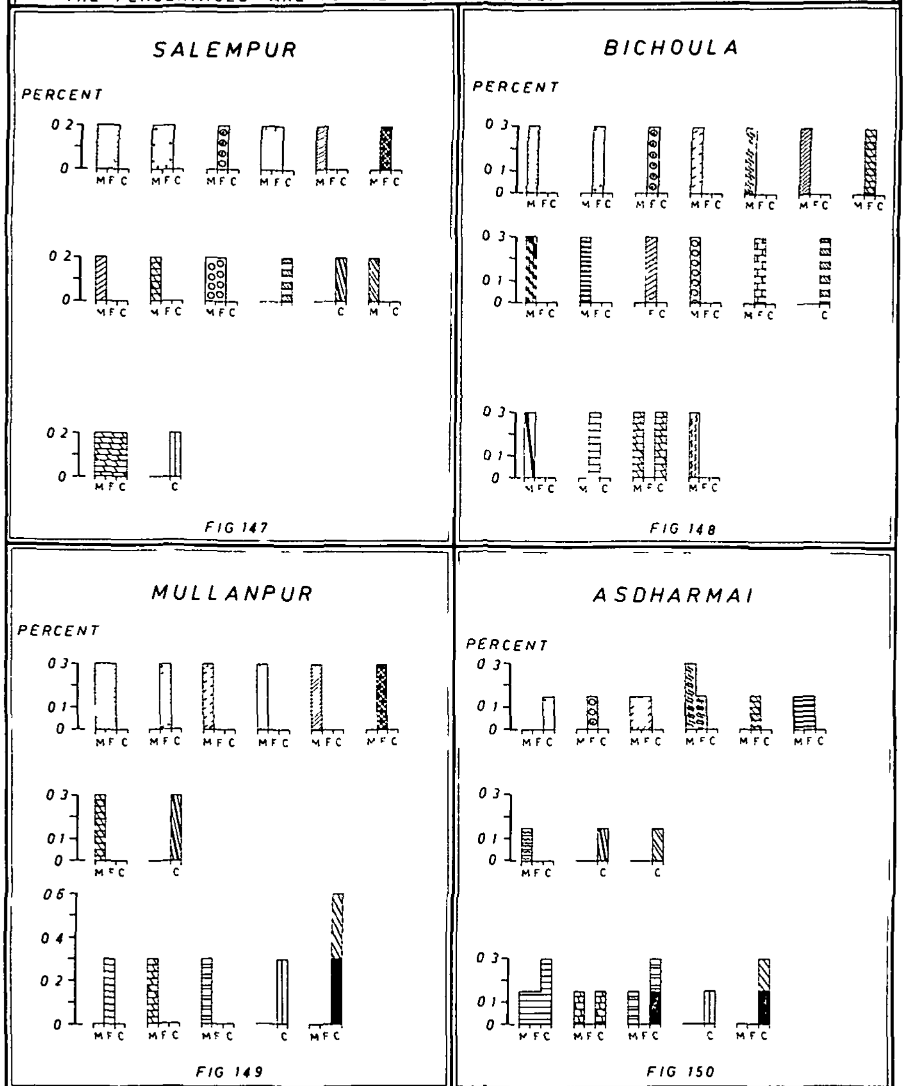


FIG 147 FIG 148 FIG 149 FIG 150

DEFICIENCY DISEASES

- Night blindness
- Keratomalacia
- Xerophthalmia
- Scurvy
- Dental caries
- Rickets
- Follicular keratosis or lesions of skin
- Anorexia
- Dyspepsia
- Bad growth of bones or teeth
- Constipation
- Diabetes
- Secondary anaemia
- General weakness
- Slow healing of wounds
- Retarded formation of body (adults)
- Low birth weight in babies
- Stunted growth in children
- Mortality with famine dropsy

DISEASES INCREASED BY NUTRITIONAL DEFICIENCIES

- Biliousness
- Scabies
- Vomiting in children
- Pneumonia
- Small-pox
- Tuberculosis
- Disease in bronchial tubes
- Mortality

The village has the 5.2 per cent morbidity from such diseases which is the highest among all villages lying in the loamy soil tracts.

2. It will be seen from Table CXXIX that the village Mullanpur has dietary deficiency of 6297.3 I.U. of vitamin A, 197.7 mg. of ascorbic acid, 35.3 gm. of fat, 447.1 mg. of calcium, 154.3 grams of cabohydrates and 5.6 grams of protein. There are considerable deficiencies of vitamin A, C, calcium and fat and some deficiency of protein. Other nutrient elements are sufficient in the diet.

Fig. 146 shows that 4.5 per cent of the village population has been suffering from the nutritonal deficiency diseases or the diseases increased by nutritional deficiencies during 1962-63.

It will be seen from Fig. 149 that none of the diseases, except night-blindness and xerophthalmia, has two patients in the village. The diseases found among adults are those of night-blindness , keratomalacia, scurvy, follicular keratosis or lesions of skin, anorexia, dyspepsia and allied diseases of pneumonia , scabies and biliousness. The children suffer from stunted growth, vomiting and small-pox.

3. The deficiencies of nutrient elements in the village Asdharmai are given in TableCXXX. The deficiencies of vitamin A, ascorbic acid, calcium, and fat are most remarkable. The deficiencies are in order as 6439.3 I.U. of vitamin A, 197.7mg. of ascorbic acid, 484.5 mg. of calcium and 36.5 grams of fat. Other deficiencies are of 63.8 grams of carbohydrates, 11.2 grams of protein and a lower degree of riboflavin deficiency being 0.03 mg.Other nutrient elements are well sufficient in the diet of the villagers.

TABLE CXXIX

NUTRITION BALANCE SHEET

Village Mullanpur

Cereals	Consumption per head per day in grams	Protein gm.	Carbo-hydrate gm.	Fat gm.	Vitamin A I.U.	Thiamine (Vitamin B1) mg.	Riboflavin (Vitamin B2) mg.	Niacin mg.	Ascorbic acid (Vitamin C) mg.	Calcium mg.	Phosphorus mg.	Iron mg.
Bulrush millet	67.4	7.8	45.5	3.4	148.3	0.22	.11	2.2	0	28.3	181.3	9.6
Bulrush millet Big millet	3.6	0.4	2.5	0.1	5.4	.01	.01	0.1	0	1.2	8.8	0.4
Big millet	2.6	.3	1.9	-	2.1	.01	.01	-	0	0.7	5.8	0.2
Bulrush millet maize	2.8	.3	1.9	0.1	24.1	.01	-	0.1	0	0.7	8.6	0.2
Pulses	3.2	.7	1.8	0.1	7.0	.01	.02	0.1	0	2.3	9.7	0.2
Maize	29.3	3.3	19.4	1.1	440.0	0.12	.03	0.4	0	2.9	101.9	0.6
Rice (Transplanted)	17.6	1.2	13.8	0.1	0	.02	.01	0.3	0	1.8	28.2	0.5
Rice (Broadcast)	9.2	0.7	7.7	0.1	0	.02	.01	0.4	0	1.1	16.1	0.3
Sugar (gur.)	11.2	-	10.9	-	-	-	-	-	-	3.1	0.4	-
Wheat	236.8	28.6	164.3	4.0	116.0	1.16	.69	10.2	0	113.7	1001.7	27.2
Wheat-barley	93.0	10.9	64.9	1.4	30.7	0.45	0.23	4.6	0	34.4	296.7	6.8
Wheat-gram	79.9	11.7	52.0	2.8	145.8	0.31	.32	2.6	1.2	99.9	293.6	8.6
Barley	22.4	2.6	15.6	.3	3.8	.11	.04	1.2	0	5.8	48.2	.7
Barley-peas	36.3	5.7	22.9	.4	15.1	.17	.11	1.3	0	18.3	93.1	1.5
Peas-gram	8.8	1.6	5.2	.3	16.8	.03	.04	0.2	0.1	12.2	26.8	0.7
Barley-gram	3.3	0.5	2.2	.1	5.5	.01	.01	0.1	-	3.8	8.7	0.2
Barley-peas-wheat	3.9	0.6	2.5	0.1	1.7	0.02	0.01	0.2	0	1.9	12.2	0.3
Gram	6.5	1.1	3.9	0.3	20.5	.02	.03	0.1	.2	13.1	20.3	0.7
Peas	1.7	0.3	0.9	-	1.1	.01	.01	0.1	0	1.3	5.1	0.1
Peas-wheat	1.7	0.3	1.1	-	0.9	.01	0.01	0.1	0	1.0	6.1	0.1
Wheat-gram-peas	1.3	0.2	0.8	-	1.9	.01	0.01	-	-	1.4	4.5	0.1
Potato	40.0	0.6	9.0	-	16.0	.04	-	0.5	6.8	4.0	16.0	0.3
Total		79.4	450.7	14.7	1002.7	2.77	1.71	24.8	8.3	352.9	2193.8	59.3
Deficiencies		g.	g.	g.	I.U.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
By Standard I		5.6	154.3	45.3								
Standard II		-			3997.3	-	-	-	41.7	447.1	-	-
Standard III					3747.3	-	-	-	40.7	597.1	-	-
Standard IV		-	-	35.3	6297.3	-			191.7	447.1	-	-

TABLE CXXX

NUTRITION BALANCE SHEET

Village Asdharmai

Cereals etc.	Consumption per head per day in grams	Protein grams	Carbo-hydrate grams	Fat grams	Vitamin A I.U.	Thiamine mg.	Ribo-flavin mg.	Niacin mg.	Ascorbic acid mg.	Cal-cium mg.	Phos-phorus mg.	Iron mg.
Bulrush millet	88.1	10.2	59.5	4.4	193.8	.29	.14	2.8	0	37.0	236.9	12.6
Pulses	62.3	13.9	35.9	1.1	137.1	.28	.32	1.6	0	45.5	189.4	3.6
Big millet	10.6	1.2	7.7	.2	8.4	.04	.03	.2	0	2.7	23.5	0.6
Maize	18.4	2.0	12.2	0.7	276.4	0.08	.02	.3	0	1.8	64.0	0.4
Rice (Transplanted)	28.3	1.9	22.1	0.1	0	.03	.01	.5	0	2.8	45.3	0.9
Rice (Broadcast)	39.9	2.9	33.6	0.4	0	0.06	.05	1.6	0	4.8	69.8	1.2
Sugar (gur.)	53.2	0.1	52.2	0.1	-	-	-	-	-	14.9	2.1	-
Wheat	178.7	21.6	124.0	3.0	87.6	.88	.52	7.7	0	85.8	755.9	20.6
Wheat-gram	67.7	9.9	44.1	2.4	123.6	.26	.27	2.2	1.0	84.6	248.8	7.3
Wheat-peas	13.7	2.2	8.6	0.2	7.9	.07	.05	0.4	0	8.4	49.4	1.1
Peas-gram	2.5	0.5	1.5	0.1	4.8	.01	.01	0.1	-	3.5	7.6	0.2
Barley	0.5	.1	.3	-	.1	-	-	-	0	.1	1.1	-
Barley-peas	9.3	1.5	5.9	0.1	3.9	.04	.03	0.3	0	4.7	23.9	0.4
Barley-wheat	43.7	5.2	30.4	0.7	14.4	0.21	0.11	2.1	0	16.2	139.4	3.2
Barley-peas-wheat	3.8	0.5	2.5	-	1.7	0.02	0.01	0.1	0	1.9	11.9	0.2
Potato	7.6	0.1	0.7	-	3.0	.01	-	0.1	1.3	0.8	3.0	0.1
Total		73.8	541.2	13.5	862.7	2.28	1.57	20.0	2.3	315.5	1872.0	52.4
Deficiencies		grams	grams	grams	I.U.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
By Standard I		11.2	63.8	46.5								
Standard II					4137.3	-	0.03	-	47.7	484.5		-
Standard III					3887.3	-	-	-	46.7	634.5		-
Standard IV				36.5	6439.3	-			197.7	484.5		

Fig. 146 shows that 3.9 per cent of the village population suffers from deficiency diseases and 0.3 per cent of the population fatally suffered from them during 1962-63.

The nutritional deficiency diseases of scurvy, constipation, and other diseases increased by deficiencies as biliousness, scabies, pneumonia and small-pox are major diseases suffered in the village. The adult males are more prone to diseases than females. But the mortality is found in children only while morbidity is lower than that of adults.

The diseases among adults are xerophthalmia, scurvy, bad growth of bones or teeth, diabetes and constipation; but the diseases among the children are keratomalacia, stunted growth of body, rickets and vomiting; while scabies, biliousness and pneumonia are found both in adults and children. The mortality diseases of children are pneumonia and small-pox, Fig. 150.

4. The dietary deficiencies in the village Paindapur are shown in Table CXXXI. Vitamin A deficiency being 6774.4 I.U., vitamin C deficiency being 181.5 mg. and calcium deficiency being 422.5 mg. are the largest. The deficiency of fat is 39.7 grams. There is also some deficiency of carbohydrate as well as that of protein. Thiamine and iron contents are also lacking in the diet and riboflavin is also lacking.

The morbidity of deficiency or allied diseases in the village is 4.8 per cent of the population during 1962-63, as is shown in Fig. 146. The mortality rate due to these diseases is 0.5 per cent. Fig.151 shows that the adults are more victims of these diseases than children.

NUTRI1

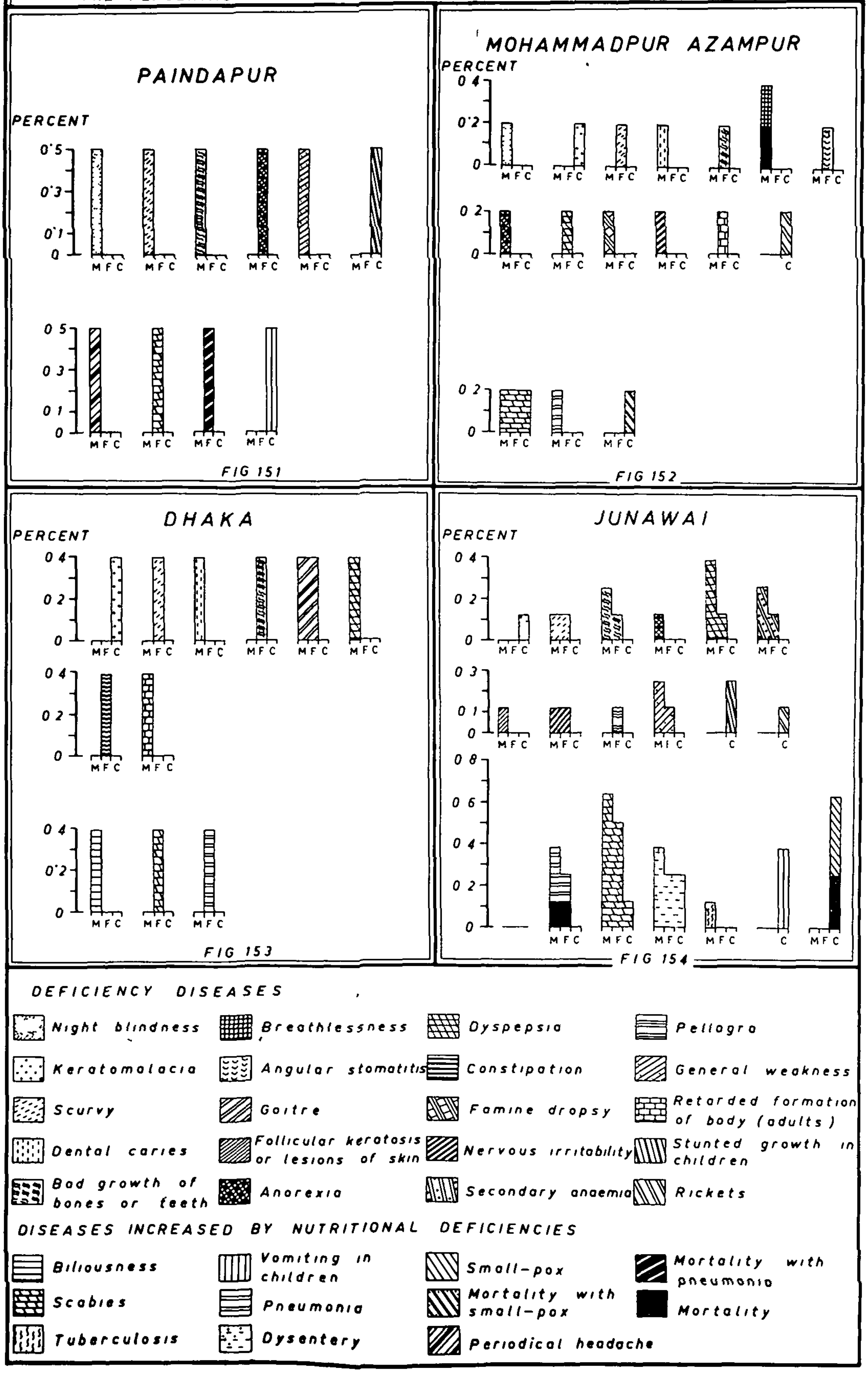
Village Paindapur

Cereals etc.	Consumption per head per day in grams	Protein grams	Carbo-hydrate grams	Fat grams	Vitamin A I.U.	Thiamine mg.	Ribo-flavin mg.	Niacin mg.	Ascorbic acid mg.	Cal-cium mg.	Phos-phor[illegible]s mg.	Iron mg.
Rice (Transplanted)	176.3	11.9	137.9	0.9	0	0.16	0.05	3.3	0	17.6	282.[illegible]	5.5
Rice (Broadcast)	16.5	1.3	15.5	0.2	0	.03	0.03	.6	0	2.1	32.[illegible]	0.6
Big millet	14.2	1.8	11.5	0.3	12.5	0.06	.04	.3	0	4.0	35.[illegible]	0.9
Pulses	14.6	3.3	8.4	0.2	32.1	0.07	.07	.4	0	10.7	44.[illegible]	0.8
Small millet	5.5	0.3	3.6	0.1	0	.01	.01	.2	0	1.1	15.[illegible]	0.2
Sugar (gur)	66.4	0.1	65.2	0.1	-	-	-	-	-	18.6	2.[illegible]	-
Wheat	43.7	5.3	30.3	0.7	21.4	0.21	0.13	1.9	0	20.9	184.[illegible]	5.[illegible]
Wheat-gram	174.7	25.5	113.7	6.1	318.8	0.68	.69	5.6	2.6	218.4	642.[illegible]	18.9
Peas	39.3	7.7	22.2	0.4	25.9	0.18	0.15	2.6	0	29.5	117.[illegible]	2.[illegible]
Barley	18.8	2.2	13.1	.2	3.2	.09	.04	1.0	0	4.9	40.[illegible]	.6
Gram	13.8	2.4	8.4	.7	43.6	.04	.07	0.3	0.4	27.9	43.[illegible]	1.4
Barley-peas-gram	10.4	1.7	6.5	0.3	13.8	.04	.04	0.3	0.1	10.5	28.[illegible]	0.6
Lentil	4.3	1.1	2.5	-	19.4	.02	.02	0.1	0	2.9	12.[illegible]	.2
Potato	90.4	1.4	20.4	0.1	36.2	.09	.01	1.1	15.4	9.0	36.[illegible]	.6
Total		66.0	459.2	10.3	526.9	1.68	1.35	17.7	18.5	378.1	1516.[illegible]7	37.3
Deficiencies		grams	grams	grams	I.U.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
By Standard I		19.4	148.6	49.7								
Standard II		4.3			4474.4	-	0.25	-	31.5	422.5		
Standard III		3.3			4224.4	-	0.05	-	30.5	572.5		
Standard IV		4.3	-	39.7	6774.4	0.13			181.5	422.5	-	2.9

NUTRITIONAL DEFICIENCY DISEASES

1962-63

THE PERCENTAGES ARE TO THE TOTAL POPULATION OF EACH VILLAGE



None of the diseases has more than one patient in the village. The diseases among adults are night-blindness, scurvy, general weakness, anorexia and scabies; while bad growth of teeth and periodical headache are the minor diseases. The children suffer from stunted growth and vomiting.

5. The deficiency of nutrients in the village Mohammadpur Azampur, as shown in Table CXXXII , is 6207.1 I.U. of vitamin A, 191.6 mg. of ascorbic acid, 38.4 grams of fat, 469.6 mg. of calcium while deficiency of protein and iron are small, being 2.6 grams and 2.8 mg. respectively. The III standard shows large deficiency of calcium, 619.6mg. The II standard shows a deficiency 0.15 mg. of riboflavin.

The morbidity of deficiency diseases in the village is 3.9 per cent as shown in Fig. 146. The mortality due to them is 0.5 per cent during 1962-63.

Fig. 152 shows that the diseases among adults are night-blindness, scurvy, dental caries, breathlessness , angular stomatitis, scabies,anorexia dyspepsia, famine dropsy, nervous irritability and pneumonia; while bad growth of teeth and retarded formation of body (adult) are also present. The diseases among children are keratomalacia and rickets.

6. The dietary deficiencies of nutrients in the village Dhaka, as shown in Table CXXXIII, are also serious. The last standard gives very large deficiencies , particularly of vitamin A,C, calcium , fat and iron. There are deficiencies of 6771.7 I.U. of vitamin A, of 196.0 mg. of ascorbic acid, of 39.0 grams of fat, of 4.0 mg. of iron, of 431.8 mg. of calcium and in addition , 1.0 gram of protein and 0.01 mg. of thiamine.

TABLE CXXXII

NUTRITION BALANCE SHEET

Village Mohammadpur Azampur

Cereals etc.	Consumption per head per day in grams	Protein grams	Carbo-hydrate grams	Fat grams	Vitamin A I.U.	Thiamine mg.	Ribo-flavin mg.	Niacin mg.	Ascorbic acid mg.	Cal-cium mg.	Phos-phorus mg.	Iron mg.
Rice (Boradcast)	79.6	5.9	67.0	0.8	0	0.17	.13	3.1	0	9.6	139.3	2.3
Rice (Transplanted)	39.2	2.7	30.7	0.2	0	.04	.01	0.7	0	3.9	62.7	1.2
Big millet	48.3	5.5	35.1	0.9	38.2	.18	.14	.9	0	12.1	107.2	2.8
Bulrush millet	1.2	.1	.8	0.1	4.6	-	-	-	0	0.5	3.2	0.2
Big millet bulrush millet	18.4	2.1	12.9	0.6	27.5	0.06	.04	.5	0	6.2	45.2	1.8
Pulses	26.4	5.9	15.2	0.4	58.1	.12	.13	0.7	0	19.2	80.3	1.5
Maize	41.5	4.6	27.5	1.5	623.3	0.17	.04	0.6	0	4.2	144.4	0.8
Sugar (gur)	76.7	0.2	75.3	0.1	-	-	-	-	-	21.5	3.1	-
Wheat	79.9	9.7	55.5	1.4	39.2	0.39	.23	3.4	0	38.4	337.9	9.2
Gram	10.4	1.8	6.3	0.6	32.9	.03	.05	0.2	0.3	21.0	32.4	1.1
Barley	4.5	.5	3.1	.1	.8	.02	.01	.2	0	1.2	9.7	.1
Peas	44.4	8.7	25.1	0.5	29.3	.21	.17	2.9	0	33.3	132.3	2.3
Wheat-gram	116.1	16.9	75.6	4.1	211.9	.45	.46	3.7	1.7	145.1	426.7	12.5
Wheat-barley	9.6	1.1	6.7	0.1	3.2	0.05	.02	0.5	0	3.6	30.6	0.7
Barley-peas-gram	6.8	1.1	4.2	0.2	9.0	0.03	.02	0.2	0.1	6.9	18.7	0.4
Potato	37.3	0.6	8.4	-	14.9	.04	-	0.4	6.3	3.7	14.9	0.3
Total		67.4	449.4	11.6	1092.9	1.96	1.45	18.0	8.4	330.4	1588.6	37.2
Deficiencies		grams	grams	grams	I.U.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
By Standard I		17.6	155.6	48.4								
Standard II		2.6			3907.1	-	0.15	-	41.6	469.6		-
Standard III		1.6			3657.1	-	-	-	40.6	619.6		
Standard IV		2.6	-	38.4	6207.1	-			191.6	469.6	-	2.8

TABLE CXXXIII

NUTRITION BALANCE SHEET

Village Dhaka

Cereals etc.	Consumption per head per day in grams	Protein grams	Carbo-hydrate grams	Fat grams	Vitamin A I.U.	Thiamine mg.	Ribo-flavin mg.	Niacin mg.	Ascorbic acid mg.	Cal-cium mg.	Phos-phorus mg.	Iron mg.
Rice (Broadcast)	187.6	14.1	157.9	1.9	0	0.39	.30	7.3	0	22.5	328.3	5.4
Rice (Transplanted)	74.7	5.1	58.4	0.4	0	0.07	.02	1.4	0	7.5	119.5	2.3
Big millet	4.8	.5	3.5	0.1	3.8	.02	.01	0.1	0	1.2	10.7	0.3
Pulses	6.4	1.4	3.7	0.1	14.1	.03	.03	0.2	0	4.6	19.5	0.4
Small millet	1.9	0.1	1.2	-	0	-	-	0.1	0	0.4	5.3	0.1
Sugar (gur)	55.0	0.1	54.0	0.1	-	-	-	-	-	15.4	2.2	-
Gram	72.8	12.4	44.3	3.9	230.0	.22	.37	1.5	2.2	147.1	227.1	7.4
Lentil	20.7	5.2	12.2	0.1	93.2	.09	.10	0.3	0	14.3	60.7	0.9
Wheat	88.0	10.6	61.1	1.5	43.1	.43	.26	3.8	0	42.2	372.2	10.1
Peas	37.5	7.4	21.2	0.4	24.7	.18	.14	2.5	0	28.1	111.8	1.9
Wheat-gram	54.2	7.9	35.3	1.9	98.9	.21	.22	1.7	0.8	67.8	199.2	5.9
Barley	20.1	2.3	13.9	0.3	3.4	.09	.04	1.1	0	5.2	43.2	0.6
Barley-peas-gram	11.2	1.8	6.9	0.3	14.9	.05	.04	0.3	0.1	11.3	30.8	0.7
Potato	5.6	0.1	1.3	-	2.2	.01	-	0.1	0.9	0.6	2.2	-
Total		69.0	475.1	11.0	528.3	1.79	1.53	20.4	4.0	368.2	1532.7	36.0
Deficiencies		*grams*	*grams*	*grams*	I.U.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
By Standard I		16.0	129.9	49.0								
Standard II		1.0			4471.7	-	0.07	-	46.0	431.8	-	-
Standard III					4221.7	-	-	-	45.0	581.8		
Standard IV		1.0		39.0	6771.7	0.01			196.0	431.8	-	4.0

The morbidity of remarkable deficiency diseases and the diseases increased by deficiencies in the village is 4.2 per cent as shown in Fig. 146. However, the village is free from mortality due to these diseases. Fig. 153 shows that adults suffer more than children, but adult **males and females suffer equally.**

The diseases of morbidity are scurvy, dental caries, goitre, scabies, dyspepsia, constipation, biliousness and pneumonia. Scurvy, constipation and pneumonia are found in females. Goitre is the endemic disease of the tarai area in which the village lies.

7. The deficiencies of nutrients in the regular diets in the village Junawai, as pointed out in Table CXXXIV , are remarkable. The deficiencies of vitamins A and C, calcium and fat are large as in previous village. According to IV standard the deficiencies are as follows: 5227.1 I.U. of vitamin A. 188.8 mg. of ascorbic acid (vitamin C), 563.7 mg. of calcium, 36.5 grams of fat and 41.0 grams of carbohydrates.

The morbidity of prominent diseases correlated with deficiencies of nutrients is 6.2 per cent of the population in the village, as shown in Fig. 146. The mortality due to such diseases is 0.5 per cent. The Fig.154 reveals that the number of patients is less in children than amongst adutls; similarly adult male patients are more in number than female. Among adults , the prevalent deficiency diseases in the village during 1962-63 are scurvy, follicular keratosis of skin, dyspepsia, goitre, nervous irritability and general weakness; but the other diseases which are increased by nutritional deficiencies are scabies, pneumonia, tuberculosis and dysentery. The diseases found among children are keratomalacia, stunted growth, rickets, vomiting and small-pox. The mortality among adults is from pneumonia, but among children it is from small-pox.

TABLE CXXXIV

NUTRITION BALANCE SHEET

Village Junawai

Cereals etc.	Consumption per head per day in grams	Protein grams	Carbo-hydrate grams	Fat grams	Vitamin A I.U.	Thiamine mg.	Ribo-flavin mg.	Niacin mg.	Ascorbic acid mg.	Cal-cium mg.	Phos-phorus mg.	Iron mg.
Bulrush millet	90.0	10.4	60.8	4.5	198.0	.29	.14	2.9	0	37.8	242.1	12.9
Maize	106.9	11.9	70.8	3.8	1605.6	0.45	.11	1.5	0	10.7	372.0	2.1
Big millet	15.1	1.7	10.9	0.3	11.9	0.06	.04	.3	0	3.8	33.5	0.9
Pulses	61.4	13.7	35.4	1.0	135.1	0.28	.31	1.6	0	44.8	186.7	3.6
Rice (Broadcast)	0.3	-	0.3	-	0	-	-	-	0	-	0.5	-
Rice (Transplanted)	2.4	0.2	1.9	-	0	-	-	-	0	0.2	3.8	0.1
Sugar (gur)	50.2	0.1	49.3	0.1	-	-	-	-	-	14.1	2.0	-
Sweet Potato	46.1	0.6	13.0	0.1	4.6	.04	.02	0.7	11.1	9.2	23.1	0.4
Wheat	147.1	17.8	102.1	2.5	72.1	.72	.43	6.3	0	70.6	622.2	16.9
Barley-peas	36.5	5.7	22.9	0.4	15.1	.17	.11	1.3	0	18.4	93.6	1.5
Wheat-barley	26.3	3.1	18.3	0.4	8.7			1.3	0	9.7	83.9	1.9
Wheat-barley-peas	10.1	1.5	6.6	0.1	4.4	0.05	0.03	0.4	0	5.0	31.5	0.7
Barley-gram	5.8	0.8	3.8	0.2	9.7	0.02	0.02	0.2	0.1	6.6	15.3	0.4
Barley	0.5	.1	.3	-	.1	-	-	-	0	0.1	1.1	-
Barley-peas-gram	0.4	0.1	.2	-	.5	-	-	-	-	0.4	1.1	-
Wheat-gram	2.4	0.4	1.6	0.1	4.4					3.0	8.8	0.3
Peas-gram	1.4	0.3	0.8	-	2.7	0.01	0.01	-	-	1.9	4.3	0.1
Total		68.4	399.0	13.5	2072.9	2.23	1.30	16.6	11.2	236.3	1725.5	41.8
Deficiencies		grams	grams	grams	I.U.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
By Standard I		16.4	206.0	46.5								
Standard II		1.6			2927.1	-	0.30	-	38.8	563.7	-	-
Standard III					3677.1	-	0.10	-	37.8	713.7	-	-
Standard IV		1.6	41.0	36.5	5227.1	-			188.8	563.7	-	-

8. The village Bichoula has the dietary deficiencies of vitamin A, ascorbic acid, fat, carbohydrate and calcium, while the vitaminosis deficiencies are alarmingly large according to the IV standard which justifies lower deficiency of carbohydrates as against the I standard. The village daily diet as shown in Table CXXXV lacks 6054 I.U. of vitamin A, 199.7 mg. of ascorbic acid (vitamin C), 36.4 grams of fat, 547 mg. of calcium and 47.5 grams of carbohydrates according to the IV standard, and 212.5 grams of carbohydrates, 46 grams of fat and 9 grams of protien according to the I standard. The IV standard shows greater deficiencies of vitamin A and C than the II and III standards. The deficiency of calcium is large, particularly according to III standard. There is also riboflavin deficiency of 0.12 mg. according to II standard. Other nutrients' intake is not deficient.

Fig. 146 denotes that village Bichoula during 1962-63 had a 5.2 per cent of population suffering from various deficiency diseases and diseases increased by deficiencies and 0.3 per cent lost their lives due to them. The morbidity of these diseases in the village presents a serious condition. Fig. 148 shows the occurrence of these diseases in the village. There are the cases of scabies, night-blindness, keratomalacia, scurvy, xerophthalmia, bad growth of bones or teeth, follicular keratosis, dyspepsia, retarded formation of body (adults) and general weakness. Slow healing of wounds , constipation, low birth-weight in babies, disease in bronchial tubes and biliousness are the other diseases found in the village. The number of adult patients is bigger than that of children. Only one male patient lost his life after suffering from famine dropsy.

TABLE CXXXV

NUTRITION BALANCE SHEET

Village Bichoula

F o o d	Consumption per head per day in grams	Protein grams	Carbo-hydrate grams	Fat grams	Vitamin A I.U.	Thiamine mg.	Ribo-flavin mg.	Niacin mg.	Ascorbic acid mg.	Cal-cium mg.	Phos-phorus mg.	Iron mg.
Bulrush millet	96.3	11.2	65.0	4.8	211.9	0.32	0.15	3.0	0	40.0	259.0	13.8
Big millet	21.6	2.5	14.6	1.0	47.5	.07	.03	.7	0	9.0	58.1	3.1
Maize	43.3	4.8	28.7	1.6	650.0	.18	.04	.6	0	4.3	150.7	.9
Rice (Transplanted)	6.9	.5	5.4	0.0	0	0	0	.1	0	.7	11.0	.2
Rice (Broadcast)	5.1	.3	4.0	0	.8	.01	0	.2	0	.5	14.3	.1
Pulses	81.9	18.3	47.2	1.4	180.2	.37	.42	2.1	0	59.8	249.0	4.7
Sugar (gur)	32.8	0.1	32.2	-	-	-	-	-	-	9.2	1.3	-
Wheat	134.2	16.2	93.1	2.3	65.7	.57	.39	5.8	0	64.4	567.7	15.4
Wheat-barley	63.0	7.4	43.8	.9	20.8	.30	.16	3.0	0	26.3	194.7	4.6
Barley-peas	48.2	7.5	30.4	.6	20.0	.23	.14	1.7	0	2.4	123.6	2.5
Wheat-gram	14.3	2.1	9.3	.5	26.1	.05	.06	.5	.2	17.9	52.5	1.5
Peas-gram	4.7	.9	2.8	.1	9.0	.02	.02	.1	.1	6.5	14.3	.3
Wheat-peas	11.8	1.9	7.2	.2	6.8	.06	.04	0	0	7.2	42.5	1.0
Barley-gram-peas	1.6	.3	1.0	0	2.1	0	0	0	0	1.6	3.9	.1
Barley	1.1	.1	.8	0	.2	0	0	0	0	.3	2.4	0
Wheat-barley-peas	10.8	1.6	7.0	.2	4.8	.05	.03	.4	0	5.4	33.7	.7
Total		75.7	392.5	13.6	1245.9	2.23	1.48	18.2	0.3	252.5	1778.7	48.9
Deficiencies		grams	grams	grams	I.U.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
By Standard I		9.3	212.5	46.4								
Standard II		-	-	-	3754.1	-	0.12	-	49.1	547.5	-	-
Standard III		-	-		3504.1	-	-	-	48.7	697.5	-	-
Standard IV		-	47.5	36.4	6054.1	-	-	-	199.7	547.5	-	-

9. The deficiencies of nutrient elements in the diet of the village Shamspur as given in Table CXXXVI, are also remarkable. The chief are those of ascorbic acid: 197.3 mg., vitamin A: 6217.7 I.U., fat: 35.9 grams, calcium: 426.5 mg. and carbohydrate: 14.0 grams according to standard IV in the Table.

The resultant deficiency diseases and the diseases increased by deficiencies found in the village have a morbidity of 5.9 per cent and a mortality of 0.8 per cent of the population, as shown in Fig. 146.

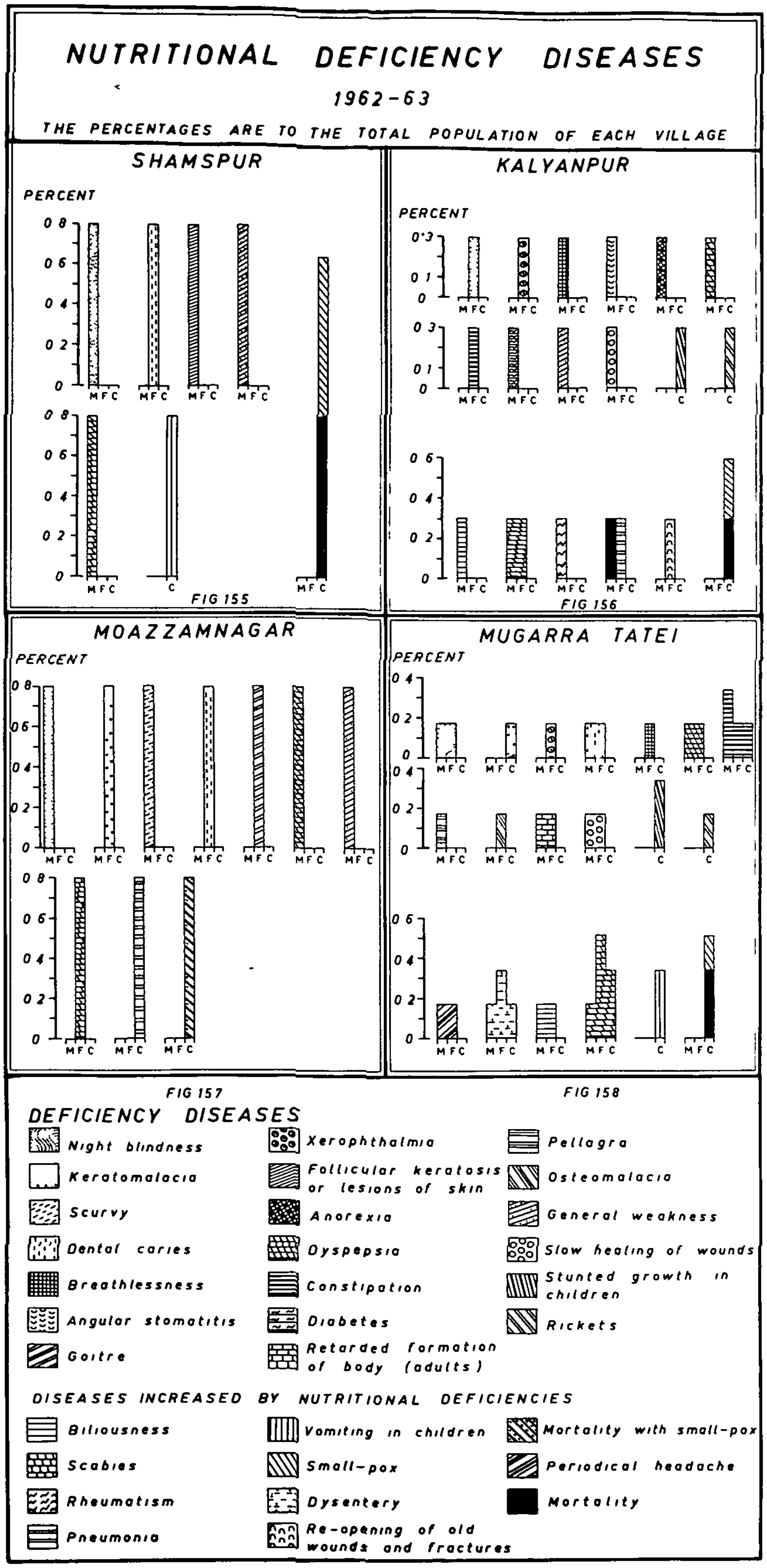
Fig. 155 shows that the number of adult females is less than that of males or children, while the mortality from small-pox occurred only in children.

The diseases among adults are night blindness, scabies, dental caries, follicular keratosis of skin and general weakness. The dieseases among children are vomiting and small-pox.

10. The village Kalyanpur has deficiencies of many nutrients in the diet, as shown in Table CXXXVII. The most remarkable deficiencies are of vitamin A, C, fat and calcium which are thus: vitamin A; 6411.7 I.U., ascorbic acid: 194.6 mg., fat: 40.1 grams, calcium: 492 mg. The deficiency of carbohydrate and protein is shown by the I standard.

Fig. 146 shows that the consequent deficiency diseases and the diseases increased by deficiencies in the village have a morbidity of 6.0 per cent and mortality of 0.6 per cent of the population. Fig. 156 shows that the number of adult female patients is less than that of males.

The diseases among the adults are night blind-ness, xerophthalmia, breathless-ness, scabies, dyspepsia, pneumonia, diabetes, general weakness and constipation. But the diseases having slight signs of deficiency are slow healing of wounds, stunted growth of child, biliousness, anorexia, rheumatism, re-opening of old wounds and small-pox.



NUTRITIONAL DEFICIENCY DISEASES
1962-63
THE PERCENTAGES ARE TO THE TOTAL POPULATION OF EACH VILLAGE
SHAMSPUR
PERCENT
FIG 155
KALYANPUR
PERCENT
FIG 156
MOAZZAMNAGAR
PERCENT
MUGARRA TATEI
PERCENT
FIG 157
FIG 158
DEFICIENCY DISEASES
Night blindness
Keratomalacia
Scurvy
Dental caries
Breathlessness
Angular stomatitis
Goitre
Xerophthalmia
Follicular keratosis or lesions of skin
Anorexia
Dyspepsia
Constipation
Diabetes
Retarded formation of body (adults)
Pellagra
Osteomalacia
General weakness
Slow healing of wounds
Stunted growth in children
Rickets
DISEASES INCREASED BY NUTRITIONAL DEFICIENCIES
Biliousness
Scabies
Rheumatism
Pneumonia
Vomiting in children
Small-pox
Dysentery
Re-opening of old wounds and fractures
Mortality with small-pox
Periodical headache
Mortality

TABLE CXXXVI

NUTRITION BALANCE SHEET

Village Shamspur

Cereals etc.	Consumption per head per day in grams	Protein grams	Carbo-hydrate grams	Fat grams	Vitamin A I.U.	Thiamine mg.	Ribo-flavin mg.	Niacin mg.	Ascorbic acid mg.	Cal-cium mg.	Phos-phorus mg.	Iron mg.
Big millet bulrush millet	58.2	6.7	40.8	2.0	87.0	0.20	0.12	1.5	0	19.5	142.9	5.8
Bulrush millet	33.9	3.9	22.9	1.7	74.6	0.11	.05	1.1	0	14.2	91.2	4.8
Rice (Broadcast)	45.2	3.4	38.1	0.5	0	0.09	.07	1.8	0	5.4	79.1	1.3
Rice (Transplanted)	25.2	1.7	19.7	0.1	0	.02	.01	0.5	0	2.5	40.3	0.8
Maize	34.6	3.8	22.9	1.2	519.7	0.15	.03	0.5	0	3.5	120.4	0.7
Pulses	12.3	2.7	7.1	0.2	27.1	.06	.06	0.3	0	8.9	37.4	0.7
Big millet	8.9	1.0	6.5	.2	7.0	.03	.02	.2	0	2.2	19.8	0.5
Sugar (gur)	79.2	0.2	77.8	0.1	-	-	-	-	-	22.2	3.2	-
Gram	44.5	7.6	27.1	2.4	140.6	.13	.23	0.9	1.3	89.9	138.8	4.5
Peas	50.2	9.9	28.4	0.6	3.1	.24	.19	3.3	0	37.7	149.6	2.6
Lentil	0.3	0.1	0.2	-	1.4	-	-	-	0	0.2	0.9	-
Wheat	106.7	12.9	74.0	1.8	52.3	.52	.31	4.6	0	51.2	451.3	12.3
Wheat-gram	92.9	13.6	60.5	3.3	169.5	.36	.37	2.9	1.4	116.1	341.4	10.0
Total		67.5	426.0	14.1	1082.3	1.91	1.46	17.6	2.7	373.5	1616.3	44.0
Deficiencies		grams	grams	grams	I.U.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
By Standard I		17.5	179.0	45.9								
Standard II		2.5			3917.7	-	0.14	-	47.3	426.5	-	-
Standard III		1.5			3667.7	-	-	-	46.3	576.5	-	-
Standard IV		2.5	14.0	35.9	6217.7	-	-	-	197.3	426.5	-	-

TABLE CXXXVII
NUTRITION BALANCE SHEET
Village Kalyanpur

Cereals etc.	Consumption per head per day in grams	Protein grams	Carbo-hydrate grams	Fat grams	Vitamin A I.U.	Thiamine mg.	Ribo-flavin mg.	Niacin mg.	Ascorbic acid mg.	Cal-cium mg.	Phos-phorus mg.	Iron mg.
Rice (Broadcast)	97.1	7.3	81.8	0.9	0	0.20	.16	3.8	0	11.7	169.9	2.8
Rice (Transplanted)	53.5	3.6	41.8	0.3	0	.05	.02	1.0	0	5.4	85.6	1.7
Big millet	34.2	3.9	24.8	.6	27.0	0.13	0.09	.6	0	8.6	75.9	1.9
Bulrush millet	25.2	2.9	17.0	1.3	55.4	0.08	.04	.8	0	10.6	68.3	3.6
Big millet bulrush millet	1.6	0.2	1.1	0.1	2.4	0.01	0.00	-	0	0.5	3.9	0.2
Pulses	51.7	11.5	29.8	0.9	113.7	.23	.26	1.3	0	37.7	157.2	2.9
Maize	0.8	0.1	0.5	-	12.0	-	-	-	0	.1	2.8	-
Small millet	0.4	-	0.3	-	0	-	-	-	0	.1	1.1	-
Sugar (gur)	82.9	0.2	81.4	0.1	-	-	-	-	-	23.2	3.3	-
Sweet Potato	14.2	0.2	4.0	-	1.4	0.01	0.01	0.1	3.4	2.8	7.1	0.1
Wheat gram	77.4	11.3	50.4	2.7	141.3	.30	.31	2.5	1.2	96.8	284.4	8.4
Wheat	42.7	5.2	29.6	0.7	20.9	0.21	.12	1.8	0	20.5	180.6	4.9
Peas gram	47.6	8.8	27.9	1.5	90.9	0.19	.21	0.9	0.7	65.9	45.2	3.7
Wheat barley	23.9	2.8	16.6	0.4	7.9	0.11	.06	1.2	0	8.8	76.2	1.7
Barley peas	16.5	2.6	10.4	0.2	6.8	0.08	0.05	5.0	0	8.3	42.3	0.7
Wheat peas	4.3	0.7	2.7	0.1	2.5	0.02	0.01	0.1	0	2.6	15.5	0.4
Barley gram	3.4	0.5	2.2	0.1	5.7	0.01	.01	0.1	0.1	3.9	8.9	0.2
Peas	0.6	0.1	0.3	-	.4	-	-	-	0	0.5	1.8	0.3
Total		61.9	422.6	9.9	488.3	1.63	1.35	19.2	5.4	308.0	1230.0	33.5
Deficiencies		grams	grams	grams	I.U.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
By Standard I		23.1	182.4	50.1								
Standard II		8.1			4511.7	-	0.25	-	44.6	492.0		-
Standard III		7.2			4261.7	-	0.05	-	43.6	642.0		-
Standard IV		8.1	17.4	40.1	6411.7	0.17			194.6	492.0	170.0	6.5

11. There are many deficiencies of nutrients in the daily diet of village Moazzamnagar, as shown in Table CXXXVIII. Some of them are large, as ascorbic acid: 193.1 mg., vitamin A: 6587.6 I.U., fat: 37.4 grams, Calcium : 383.9 mg. , Carbohydrate: 21.0 grams and iron : 1.4 mg. according to the last standard.

The remarkable deficiency diseases and other diseases increased by deficiencies in the village have a morbidity of 7.3 per cent and a mortality of 0.8 per cent of the village population, as evident in Fig. 146. The other Fig. 157 explains the individual diseases among different age groups.

The diseases among adults are night blindness, keratomalacia, scurvy, dental caries, goitre, scabies, dyspepsia and general weakness.

Chief Children

The diseases suffered by a child is pneumonia. There is one case of mortality due to small-pox. The mortality due to deficiency diseases is practically absent in the village, (Fig. 157).

12. The dietary deficiencies of nutrients in the village Mugarra Tatei, as given in Table CXXXIX are considerable. The alarming deficiencies are of vitamin A, C, fat, calcium and carbohydrates. According to the IV standard the deficiencies are as follows: vitamin A: 6095.5 I.U., ascorbic acid (vitamin C): 151.8 mg. , fat: 39.0 grams, calcium 595.1 mg., protein: 13.8 grams and iron: 5.6 mg.

The deficiencies of nutrients have resulted in so many diseases in the village which have a morbidity of 6.6 per cent and mortality of 0.3 per cent of village population, as given in Fig. 146. These diseases are

TABLE CXXXVIII

NUTRITION BALANCE SHEET

Village Moazzamnagar

Cereals etc.	Consumption per head per day in grams	Protein grams	Carbo-hydrate grams	Fat grams	Vitamin A I.U.	Thiamine mg.	Ribo-flavin mg.	Niacin mg.	Ascorbic acid mg.	Cal-cium mg.	Phos-phorus mg.	Iron mg.
Big millet	71.3	8.1	51.8	1.4	56.3	0.26	0.19	1.3	0	17.8	158.2	4.1
Bulrush millet	24.9	2.9	16.8	1.2	54.8	.08	.04	.8	0	10.5	66.9	3.6
Pulses (arhar)	61.9	13.8	35.7	1.1	136.2	.28	.32	1.6	0	45.2	188.2	3.6
Rice (Transplanted	34.7	2.4	27.1	0.2	0	.03	.01	.7	0	3.5	55.5	1.1
Rice (Broadcast)	39.0	2.9	32.8	0.4	0	0.08	0.06	1.5	0	4.7	68.3	1.1
Small millet	8.7	0.5	5.7	0.2	0	.02	.01	.4	0	1.7	24.3	0.2
Sugar (gur)	73.9	0.1	72.6	0.1	-	-	-	-	-	20.7	2.9	-
Sweet Potato	15.5	0.2	4.4	-	1.6	0.01	.01	0.1	3.7	3.1	7.8	0.1
Wheat-gram	176.4	25.8	114.8	6.2	321.9	0.69	0.71	5.8	2.6	220.5	648.3	19.1
Peas	40.3	7.9	22.8	0.4	26.6	.19	.15	2.7	0	30.2	120.1	2.1
Barley-peas-gram	26.4	4.3	16.4	0.7	35.1	0.11	.09	0.8	0.3	26.7	72.6	1.6
Lentil	10.0	2.5	5.9	0.1	45.0	.05	.05	0.2	0	6.9	29.3	0.5
Gram	9.8	1.7	5.9	0.5	30.9	.03	.05	0.2	0.3	19.8	30.6	0.9
Barley-peas-wheat	4.8	0.7	3.1	0.1	2.1	.02	.01	0.2	0	2.4	14.9	0.3
Barley-peas	3.8	0.6	2.4	-	1.6	.02	0.01	0.1	0	1.9	9.7	0.2
Barley	1.9	.2	1.3	-	.3	.01	-	.1	0	.5	4.1	.1
Total		74.9	419.5	12.6	712.4	1.88	1.71	16.3	6.9	416.1	1501.7	38.6
Deficiencies		grams	grams	grams	I.U.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
By Standard I		10.1	185.5	47.4								
Standard II					4287.6	-	-	-	43.1	383.9	-	-
Standard III					4037.6	-	-	-	42.1	533.9	-	-
Standard IV			21.0	37.4	6587.6				193.1	383.9	-	1.4

TABLE CXXXIX

NUTRITION BALANCE SHEET

Village Mugarra Tatei

Cereals etc.	Consumption per head per day in grams	Protein grams	Carbo-hydrate grams	Fat grams	Vitamin A I.U.	Thiamine mg.	Ribo-flavin mg.	Niacin mg.	Ascorbic acid mg.	Cal-cium mg.	Phos-phorus mg.	Iron mg.
Rice (Broadcast)	48.9	3.7	41.2	0.5	0	0.10	0.08	1.9	0	5.9	85.6	1.4
Maize	63.5	7.0	42.0	2.3	953.8	0.27	0.06	0.9	0	6.4	220.9	1.3
Bulrush millet	46.9	5.4	31.7	2.3	103.2	0.15	.08	1.5	0	19.7	126.2	6.7
Big millet	29.6	3.4	21.5	.6	23.4	0.11	0.08	.5	0	7.4	65.7	1.7
Pulses (arhar)	2.1	0.5	1.2	-	4.6	0.01	0.01	.1	0	1.5	6.4	0.1
Sugar (gur)	47.5	0.1	46.6	-	-	-	-	-	-	13.3	1.9	-
Sweet Potato	201.0	2.4	56.7	0.6	20.1	0.16	0.08	1.4	48.2	40.2	100.5	1.6
Wheat	112.7	13.6	78.2	1.9	55.2	.55	.33	4.8	0	54.1	476.7	12.9
Wheat-barley	82.7	9.8	57.5	1.2	27.3	.39	.21	4.1	0	30.6	263.8	6.0
Barley	66.9	7.7	46.6	0.9	11.4	.31	.13	3.6	0	17.4	143.8	2.0
Peas-barley	15.6	2.4	9.8	0.2	6.5	.07	.05	0.6	0	7.9	40.0	0.6
Peas-wheat-barley	1.1	0.2	-	0.5	-	.01	-	-	0	0.5	3.4	0.1
Total		56.2	433.0	11.0	1205.5	2.13	1.11	19.4	48.2	204.9	1534.9	34.4
Deficiencies		grams	grams	grams	I.U.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
By Standard I		28.8	172.0	49.0								
Standard II		13.8			3794.5	-	0.49	-	1.8	595.1	-	-
Standard III		12.8			3544.5	-	0.29	-	0.8	745.1	-	-
Standard IV		13.8	7.0	39.0	6095.5	-			151.8	595.1	-	5.6

more among adults than among children. However, children and adult males share nearly equally, while mortality is not found among adults , as is shown in Fig. 158.

The major diseases among adults are night-blindness, xerophthalmia, dental caries, breathless-ness , dyspepsia, pellagra, osteomalacia and constipation. Among children main diseases are keratomalacia, stunted growth, vomiting, rickets and small-pox. Scabies and dysentery are found in both adults and children.

The occurrence of these diseases may be correlated with certain outstanding deficiencies of nutrients. But the diseases with slow process of development and slight signs of sickness are slow healing of wounds and stunted growth of body in both adults and children. Other diseases found are dysentery, scabies, biliousness, child vomiting and small-pox. The mortality in the village is due to only small-pox .

13. There are numerous nutritional deficiencies which are very serious in the diets of village Guteti Uttar, as given in Table CXL. As in the previous villages, the lack of vitamins A and C, fat and calcium is large in this village too. The deficiencies according to the last standard are as follows: vitamin A: 6148.9 I.U., ascorbic acid: 157.4 mg., fat:38.9 grams calcium: 561.7 mg. , protein : 11.7 grams, carbohydrate 7.8 grams and iron: 7.1 mg.

The nutritional deficiencies have caused and developed numerous diseases which have a morbidity of 7.5 per cent and a mortality of 0.7 per cent of the village population, as shown in Fig. 146.

TABLE CXL

NUTRITION BALANCE SHEET

Village Guteti Uttar

Cereals etc.	Consumption per head per day in grams	Protein grams	Carbo-hydrate grams	Fat grams	Vitamin A I.U.	Thiamine mg.	Ribo-flavin mg.	Niacin mg.	Ascorbic acid mg.	Cal-cium mg.	Phos-phorus mg.	Iron mg.
Rice (broadcast)	82.8	6.2	69.4	0.8	0	0.17	0.09	3.2	0	9.9	144.9	2.4
Bulrush millet	62.1	7.2	41.9	3.1	136.6	0.20	.1	1.9	0	26.1	167.0	8.9
Big millet	39.5	4.5	28.7	.8	31.2	0.15	.11	.7	0	9.9	87.7	2.3
Maize	51.6	5.7	34.2	1.9	775.0	0.22	.05	.7	0	5.2	179.6	1.0
Pulses (arhar)	7.4	1.7	4.3	0.1	16.3	.03	.04	.2	0	5.4	22.5	0.4
Small millet	0.6	-	0.4	-	0	-	-	-	0	0.1	1.7	-
Sugar (gur)	63.8	0.1	62.7	0.1	-	-	-	-	-	17.9	2.6	-
Sweet Potato	150.0	1.8	42.3	0.5	15.0	0.12	.06	1.1	36.0	30.0	75.0	1.2
Wheat	91.6	11.1	63.6	1.6	44.9	0.45	.27	3.9	0	43.9	387.5	10.5
Barley	36.7	4.2	25.5	0.5	6.2	.17	.07	1.9	0	9.5	78.9	1.1
Barley-gram-peas	52.1	8.4	32.5	1.4	69.3	0.22	.19	1.6	0.5	52.6	143.3	3.2
Peas	27.3	5.4	15.4	0.3	18.0	.13	.10	1.8	0	20.5	81.4	1.4
Lentil	5.4	1.4	3.2	-	24.3	.02	.03	0.1	0	3.7	15.8	0.3
Potato	35.7	0.6	8.1	-	14.3	.04	-	0.4	6.1	3.6	14.3	0.2
Total		58.3	432.2	11.1	1151.1	1.92	1.12	17.5	42.6	238.3	1402.2	32.9
Deficiencies		grams	grams	grams	I.U.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
By Standard I		26.7	172.8	48.9								
Standard II		11.7			3848.9	-	0.48	-	7.4	561.7	-	-
Standard III		10.7			3598.9	-	0.28	-	6.4	711.7		-
Standard IV		11.7	7.8	38.9	6148.9	-			157.4	561.7	-	7.1

NUTRITIONAL DEFICIENCY DISEASES

1962–63

THE PERCENTAGES ARE TO THE TOTAL POPULATION OF EACH VILLAGE

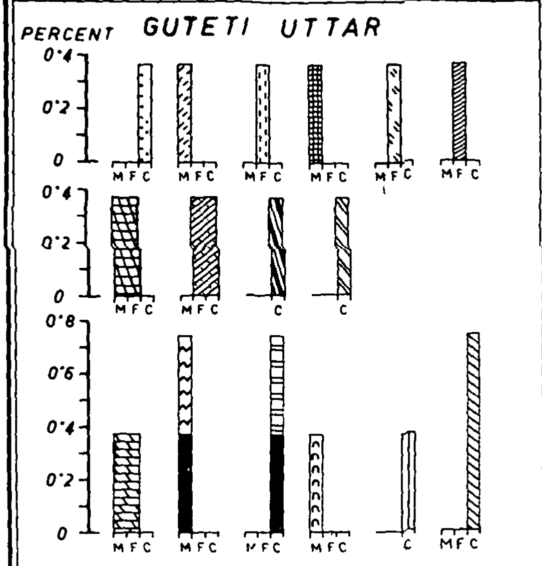


FIG 159

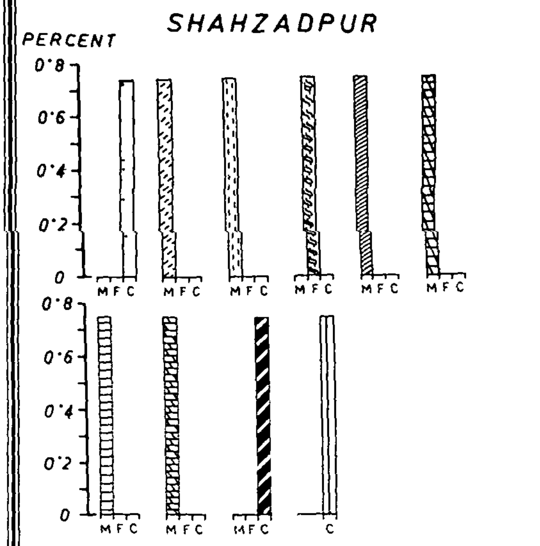


FIG 160

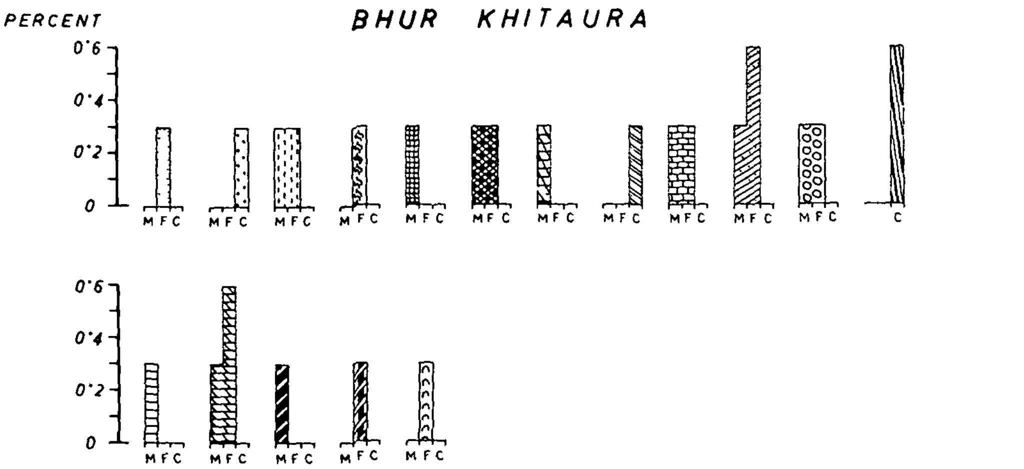


FIG 161

DEFICIENCY DISEASES

- Night blindness
- Keratomalacia
- Scurvy
- Dental caries
- Bad growth of bones or teeth
- Breathlessness
- Flabby muscles
- Follicular kerotosis or lesions of skin
- Anorexia
- Dyspepsia
- Secondary anaemia
- General weakness
- Slow healing of wounds
- Retarded formation of body (adults)
- Rickets
- Stunted growth in children

DISEASES INCREASED BY NUTRITIONAL DEFICIENCIES

- Biliousness
- Scabies
- Rheumatism
- Vomiting in children
- Pneumonia
- Re-opening of old wounds and fractures
- Small-pox
- Mortality with tuberculosis
- Mortality with pneumonia
- Mortality

SOURCE : THE FIGURES 147–161 ARE BASED ON THE FIELD WORK

Fig. 159 shows that adult female patients are lower in number than either children or adult males. The diseases among adults are follicular keratosis of skin, flabby muscles, re-opening of old wounds, general weakness, dental caries, breathlessness, rheumatism and scurvy. As a matter of fact, the first five diseases mentioned above are not, in general, taken up as serious diseases by the ignorant peasantry. The diseases among children are keratomalacia, stunted growth, rickets, pneumonia, vomiting and small-pox. The adult mortality is from rheumatism while child mortality is from pneumonia.

14. There are many deficiencies of nutrients in the diet in the village of Shahzadpur, as is given in Table CXLI. According to the IV standard, the deficiencies are as follows: ascorbic acid: 196.8 mg., vitamin A:6098.4 I.U. fat: 37.2 grams, calcium: 411.5 mg., carbohydrate: 31.1 grams and protein: 7.1 grams. But according to the I standard, the deficiencies of protein, carbohydrate and fat are larger, being 22.1, 196.1 and 47.2 grams respectively.

The diseases caused or increased by nutritional deficiencies in the village, according to Fig. 146, have a morbidity of 6.7 per cent and a mortality of 0.8 per cent of the population. It will be seen from Fig. 160 that adult females suffer less than either children or adult males, while mortality is not found in adults.

The diseases among adults are scurvy, dental caries, scabies, dyspepsia, follicular keratosis of skin and biliousness. Other diseases are bad growth of teeth and child vomiting. The pattern of the occurrence of diseases shows that male adults are most prone to suffer from such diseases.

TABLE CXLI

NUTRITION BALANCE SHEET

Village Shahzadpur

Cereals etc.	Consumption per head per day in grams	Protein grams	Carbo-hydrate grams	Fat grams	Vitamin A I.U.	Thiamine mg.	Ribo-flavin mg.	Niacin mg.	Ascorbic acid mg.	Cal-cium mg.	Phos-phorus mg.	Iron mg.
Maize	47.3	5.3	31.3	1.7	710.4	0.19	.05	0.7	0	4.7	164.6	0.9
Big millet	9.8	1.1	7.1	0.2	7.7	.04	.03	.2	0	2.5	21.8	.6
Pulses (arhar)	8.1	1.8	4.7	0.1	17.8	.04	.04	.2	0	5.9	24.6	0.5
Rice (Transplanted)	10.9	0.7	8.5	0.1	0	.01	-	.2	0	1.1	17.4	0.3
Sugar (gur)	88.5	0.2	86.9	0.1	-	-	-	-	-	24.8	3.5	-
Gram	105.6	18.1	64.3	5.6	333.7	.32	.54	2.2	3.2	213.3	329.5	10.8
Wheat	268.7	32.5	186.5	4.6	131.7	1.32	0.78	11.6	0	128.9	1136.6	30.9
Barley	28.1	3.2	19.6	.4	4.8	0.13	0.06	1.5	0	7.3	60.4	0.8
Total		62.9	408.9	12.8	1206.1	2.05	1.50	16.6	3.2	388.5	1758.4	44.8
Deficiencies		grams	grams	grams	I.U.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
By Standard I		22.1	196.1	47.2								
Standard II		7.1			3793.9	-	0.10	-	46.8	411.5	-	-
Standard III		6.1			3543.9				45.8	561.5		
Standard IV		7.1	31.1	37.2	6098.4				196.8	411.5		

15. The dietary deficiencies of nutrients in the village Bhur Khitaura, as given in Table CXLII, present serious dietary conditions. In accordance with the IV standard, vitamins A and C, calcium and fat are largely deficient in the diet, as vitamin A: 6583.6 I.U., ascorbic acid: 195.0 mg., fat: 37.1 grams, calcium: 538.6 mg., carbohydrate: 57.1 grams and protein : 2.5 grams.

As a result of the deficiencies, many diseases have much affected the health of the people. Some of the sufferings in the village have been due to endemic effects like pterygium and epistaxis— the result of seasonal hot, dry and dusty weather conditions. However, Fig. 146 shows that the morbidity of deficiency or allied diseases is 7.9 per cent and mortality is 0.6 per cent of the population. Fig. 161 shows that adults suffer more than children; similarly mortality is found in adults only.

The diseases found among adults in the village are nightblindness, breathlessness, scabies, dyspepsia, anorexia, general weakness and biliousness; other sicknesses and the deficiency results are bad growth of teeth, retarded formation of (adult) body, slow healing and wounds and re-opening of old wounds. The diseases found in children are secondary anaemia, keratomalacia and stunted growth of body.

An examination of the deficiencies of dietary nutrients found in the villages, as shown in the Tables CXXVIII to CXLII, reveals that the deficiencies of vitamins A and C, fat, calcium, and carbohydrate are very large in almost all the villages. In some of the villages, other deficiencies of protein, riboflavin and iron are also present , but to a lesser extent.

TABLE CXLII

NUTRITION BALANCE SHEET

Village Bhur Khitaura

Cereals etc.	Consumption per head per day in grams	Protein grams	Carbo-hydrate grams	Fat grams	Vitamin A I.U.	Thiamine mg.	Ribo-flavin mg.	Niacin mg.	Ascorbic acid mg.	Cal-cium mg.	Phos-phorus mg.	Iron mg.
Bulrush millet	155.4	18.0	104.9	7.8	341.9	.51	.25	4.9	0	65.3	418.0	22.2
Rice (Broadcast)	7.7	0.6	6.5	0.1	0	.02	.01	0.3	0	0.9	13.5	0.2
Maize	3.6	0.4	2.4	0.1	54.1	.02	-	.1	0	0.4	12.5	0.1
Big millet	3.3	0.4	2.4	0.1	2.6	.01	.01	.1	0	0.8	7.3	0.2
Pulses (arhar)	94.3	21.0	54.3	1.6	207.5	.42	.48	2.5	0	68.8	286.7	5.5
Sugar (gur)	74.4	0.1	73.1	0.1	-	-	-	-	-	20.8	2.9	-
Sweet Potato	3.6	-	1.0	-	0.4	-	-	-	0.9	0.7	1.8	-
Wheat	70.2	8.5	48.7	1.2	34.4	0.34	.20	3.0	0	33.7	296.9	8.1
Barley peas	52.0	8.1	32.8	0.6	21.6	0.24	0.15	1.9	0	26.3	133.4	2.1
Wheat barley	36.4	4.3	25.3	0.5	12.0	0.17	0.09	1.8	0	13.5	116.1	2.7
Barley	9.0	1.0	6.3	0.1	1.5	.04	.02	0.5	0	2.3	19.4	0.3
Wheat gram	7.4	1.1	4.8	0.3	13.5	.03	.03	0.2	0.1	9.3	27.2	0.8
Wheat peas barley	9.0	1.3	5.9	0.1	3.9	.04	.03	0.4	0	4.5	28.1	0.6
Barley peas gram	7.0	1.1	4.4	0.2	9.3	.03	.03	0.2	0.1	7.1	19.3	0.4
Wheat peas	7.6	1.2	4.8	0.1	4.4	.04	.03	0.2	0	4.7	27.4	0.6
Potato	23.3	0.4	5.3	-	9.3	.02	-	0.3	3.9	2.3	9.3	0.2
Total		67.5	382.9	12.9	716.4	1.93	1.33	16.4	5.0	261.4	1419.8	44.0
Deficiencies		grams	grams	grams	I.U.	mg.	mg.	mg.	mg.	mg.	mg.	mg.
By Standard I		17.5	222.1	47.1								
Standard II		2.5			4283.6	-	0.27	-	45.0	538.6	-	-
Standard III		0.5			4033.6	-	0.07	-	44.0	688.6	-	-
Standard IV		2.5	57.1	37.1	6583.6	-			195.0	538.6	-	-

The occurence of the diseases caused by malnutrition and nutritional deficiencies may be correlated with the quality and quantity of food intake which the population gets in general. A disease of nutritional deficiency may not necessarily be due to lack of one nutrient element. It may occur due to the deficiency of more than one nutrient in the diet taken concurrently by a section of population for a considerable period of years. Similarly, the deficiency of one nutrient, usually, may not necessarily be producing only one particular disease. The deficiency of one or more nutrients may produce different diseases in accordance with varying degree of deficiency of nutrients, human resistance, variable climatic conditions, various endemic relationship to malnutrition or deficiency conditions, differences of food items from place to place and changes of food items at a certain place from one period of years to another. No one nutrient functions alone and its usefulness to the body may be curtailed by the absence of other nutrients, and as only a few nutrients are stored in the body, some necessary nutrients may be discarded by the body without being used because other essential nutrients are lacking in the diet.[1] It is because satisfactory metabolism of proteins requires the co-operative activity of certain vitamins, and their lack results in abnormal

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1. Stevenson, G.T. and Miller, C., Introduction to Foods and Nutrition, (New York, 1960).

[illegible]

intermediary reactions of amino acids and formation of unusual and often deleterious end-products, while a number of vitamins appear to have specific roles in protein metabolism.[1] The diets that are markedly deficient in one vitamin are often low also in others.[2] The villagers, on the other hand, do not know the nutritional qualities or deficiencies of the food they eat unhesitatingly and habitually.

They mostly donot take notice of the nutritional deficiency diseases they suffer from, or at least, they do not take them seriously as diseases.

The re-opening of old wounds and fractures, stunted growth of adult or a child, low-birth weight, bad-growth of teeth, slow healing of wounds, bad growth of skin, dental caries and even anorexia (loss of appetite) are not seriously considered as diseases by most of the villagers.

However, the occurrence of the nutritional deficiency diseases may be attributed to deficiencies of certain nutrient elements in the dietary standard.

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1. Wiggers, C.J., Physiology in Health and Disease (Philadelphia, 1955) p. 918.

2. Diehl, H.S. Healthful Living (New York, 7th Ed., 1964), p.98.

The deficiency of vitamin A leads[1] to xerophthalmia, keratomalacia, while the teeth may be affected, the skin may be dry and thickened, and functionally the night blindness has been associated with vitamin A deficiency. The deficiencies due to vitamin A require the early administration of this vitamin to avoid the possible complication of keratomalacia. Moreover, its deficiency may also cause disturbances of body growth, skin lesions and diminution of resistence to infection. It may also produce changes in the cornea resulting in opthalmia. The deficiency of vitamin A is reflected in abnormal conditions of the eye, the skin, the upper parts of the respiratory passages, the bronchii and the genitourinary system, it is essential for normal growth and skeletal development. The diseases of upper respiratory tract are colds, grippe, flu and pneumonia. It follows from the above that bad growth of teeth, follicular keratosis of skin (skin lesions), stunted growth of body (of adult or child), low resistence to infectious diseases are correlated with the deficiency of vitamin A in the diet. The diseases of vitamin A-deficiency are found in nearly all selected villages.

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1. The diseases caused by the deficiency of vitamin A have been written by the following authors:

   * Davies, I.G. <u>Modern Public Health</u> (London, 1963), p.60 and
   * Quigley, D.T., op.cit., p. 28.
   * Joint FAO/WHO Expert Committee on Nutrition, third report, Technical Report Series No. 72, (Geneva, Dec., 1953) p.12.
   * Wiggers, C.J., op.cit., p. 1000
   * Smillie, Wilson, G., <u>Preventive Medicine and Public Health</u> (New York, 1954), p. 402.
   * Diehl, H.S., op.cit., p.99.
   * Quigley, D.T., op.cit.p.41.
   * Mc Carrison,Sir R.and Sinclair, H.M.-<u>Nutrition and Health</u> (London, mcmlxi), p.41.

The diseases caused by the deficiency of thiamine (vitamin B_1)[1] are constipation, anorexia (loss of appetite), nervous irritability, depression and weakness. This vitamin is a proenzyme which the body requires for carbohydrate metabolism, since its requirements depend upon carbohydrate metabolism, it is obvious that the greater the muscular activity, the higher the requirement of this vitamin. It is water soluble and it is not readily stored in the body. The milling process of grain removes the pericarp, depriving the food of all vitamin B_1. It influences the functioning of the nervous systems. Its deficiency also produces digestive disturbances, growth failure, weakness, multiple neuritis. The heavy consumption of '<u>gur</u>' sugar leads to high consumption of carbohydrates. But the high consumption of carbohydrates necessitates large amount of thiamine because the vitamin's requirements are also increased. The villages which have deficiency of thiamine in the diet are Paindapur, Dhaka and Kalyanpur which have also the diseases caused by the deficiency of this vitamin. Many diseases with accompanying poor appetite are responsible for grossly inadequate food intake.[2] Other villages (Figs.147 to 150,152,154,155,157 to 159 and 161) also have thiamine-deficiency diseases which may be due to deficient release of energy to the body by thiamine as a result of carbohydrate-deficiency which is found in almost all the villages.

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1. These diseases are referred by the following authors:
   * Smillie, Wilson, G., op.cit., p.403.
   * Diehl, H.S., op.cit., pp. 100-101.
   * Stevenson, G.T. and Miller, C., op.cit., pp. 195-97.
   * Wiggers, C.J., op.cit., p. 998.

2. Proudfit, F.T., op.cit., p. 369.

The deficiency of riboflavin (vitamin B_2)[1] produces the classic symptoms as cracked lips, a sore 'magenta tongue', and burning, itching eyes. The vitamin is essential to cell respiration; it is important for growth and general well-being, and for health of the skin, eyes and mouth. It is related to the utilization of protein. Angular stomatitis, as in villages Kalyanpur and Mohammadpur Azampur, may be 'due to riboflavin deficiency'.[2] This deficiency also gives rise to gastro-intestinal disorder --- (gastritis, or entritis or colitis) and to lesions of the skin.

A generous provision of this vitamin is one of the important factors on which the health of the skin, the gastro intestinal tract, and the nervous system depends. Villages Kalyanpur and Guteti Uttar, which have deficiency of vitamins B_2 and C, have the cases of rheumatism while recent investigations in regard to rheumatism indicate the need for the adequate supply of both vitamins B-complex and C.[3] The riboflavin deficiency has been associated with lesions of the mouth and tongue and with angular stomatitis and the vascularization of the cornea.

The diseases caused by the deficiency of ascorbic acid (vitamin C)[4] are spongy and bleeding gums while in more severe case a typical picture

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1. The diseases or symptoms are referred by the following writers:
   * Diehl, H.S., op.cit., p. 101.
   * Davies, I.G., op.cit., p.61.
2. May, J.M., op.cit., p. 227.
3. Mc Carrison, R and Sinclair, H.M., op.cit., p. 51.
4. The deseases caused by vitamin C-deficiency are according to the following authors:
   * Smillie, Wilson G., op.cit., p. 406.
   * Diehl, H.S., op.cit., pp. 102-3.
   * Schifferes, J.J., <u>Healthier Living</u> (New York, 1965), p. 105.
   * Quigley, D.T., op.cit., p. 33.
   * Mc Carrison, R and Sinchair, H.M., op.cit., p. 52.

scurvy develops. The vitamin is important in the formation of the inter cellular substance; it is often referred to as the 'cement' that holds the body cells together. It is also involved in the complex metabolic reactions within the cells relating to utilization of the amino acid, tyrosine, and to the proper development and protection of the health of bones, teeth, gums and blood vessels. Most of the villagers are usually accustomed to cook for a long time the leafy and other vegetables like potato, tomato, turnip, carrots, cabbage, spinach and jack fruit and consequently the vitamin is easily destroyed. Owing to the deficiency of ascorbic acid, the iron contained in the diet is not absorbed by the human body. Pulses and cereals, which constitute the most part of the diet in all the villages, contain no amount of vitamin C. Vitamin C has an anti-infective action and people receiving too little vitamin C develop tuberculosis and ulceration of the intestine and may develop rheumatism.

The deficiency of this vitamin is found in all the villages; the deficiency diseases are also found in nearly all these villages; for instance scurvy in ten out of fifteen villages (Figs. 148 to 154, 157, 159 and 160), improper and bad growth of teeth and gums in eight villages (Figs. 148, 150 to 154, 160 and 161), tuberculosis in three villages (Figs. 148, 154 and 161) and rheumatism in two villages (Figs.156 and 159). The diseases due to deficiency of vitamin D are several[1]. Rickets

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1. The diseases referred to the vitamin D deficiency are written by the following authors:
   * Smillie, Wilson G., op.cit.,p.162; 407
   * Diehl, H.S., op.cit.,p.100
   * Schifferes, J.J.,op.cit., p.96;105.
   * Mc Carrison , R and Sinclair, H.M., op.cit.,p.53

is found in children who live in dark, windowless homes. The vitamin is essential in the metabolism of calcium and phosphorus. Inadequate amounts of this vitamin in growing children results in impairment in growth of the teeth and bones, with the eventual development of rickets -- a serious bony deformity), as this is the anti-rachitic vitamin. Suffering from ~~actually~~ a nutritional disease which affects the entire organism, the rachitic child is irritable, weak, restless, anaemic, flabby, and susceptible to infection. Still other results of deficiency of this vitamin are enamel defects of the teeth; it also leads to malabsorption of calcium from the intestine, to shortage of calcium in the blood, to be imperfect deposition of lime and phosphorus in the bones; dental decay ~~does~~ also occurs.

No discussion of the importance of vitamin D can be made without an understanding of the metabolism of calcium and phosphorus; Calcium is of great physiological importance as ionic calcium maintains the permeability of cellular membranes and the state of excitability of all tissues, while the deficiency of it in insoluble calcium in bones is one of the outstanding phenomena in rickets and osteomalacia[1]. The villages of Salempur, Bichoula, Asdharmai, Mohammadpur Azampur, Paindapur, Dhaka, Junawai, Shamspur, Kalyanpur, Moazzamnagar, Mugarra Tatei, Guteti Uttar, Shahzadpur and Bhur Khitaura have one or more than one of the diseases of rickets, osteomalacia, dental caries, and impairment in growth of teeth; all these villages suffer from deficiency of calcium as is evident from Tables C XXVIII to C XLII.

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1. Wiggers, C.J., op.cit., p.1015.

Where calcium[1] is not available for normal metabolism, the body must, of course, draw upon its reserves and this results in impairment in growth of teeth and bones as is seen in several villages, Figs. 148, 150 to 154, 160 and 161. Some authorities believe that defective tooth formation in early childhood, with possible effect on increasing dental caries and particularly impairment of growth and improper development of bones, may result from a deficiency of calcium intake in childhood and youth. The requirement of calcium and phosphorus, though continuous throughout life, is greatest for the growing child and the pregnant or lactating woman. If the diet does not provide sufficient calcium to meet the needs of the body, calcium may be withdrawn from the bones and teeth; this occasionally occurs in pregnancy when calcium from the bones of the mother is utilized to meet the needs of her developing child. Bones, of course, can not be properly built without the basic materials - calcium and phosphorus. The stunted growth in children may also be due to deficiency of phosphorus or deficient utilization of phosphorus and its malabsorption; the malabsorption of phosphorus and calcium occurs due to deficiency of vitamin D, as mentioned above. Stunted growth in children is found in numerous Villages (Figs. 147, 149 to 151, 154, 156, 158, 159 and 161).

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1. The diseases of calcium and phosphorus deficiencies have been pointed out by the following authors:

   * Smillie, Wilson G., op.cit., p.400.
   * Diehl, H.S., op.cit., p.103.
   * Quigley, D.T., op.cit., p.35.
   * Schifferes, J.J., op.cit., p.105.
   * Mc Carrison, R and Sinclair, H.M., op.cit., p.42.

Bone growth is checked due to deficiency of calcium and phosphorus which are needed in abundance during active bone growth; Figs. 148,150 to 154, 160 and 161 indicate bad growth of bones and teeth and Figs.147, 149, 152, 153, 155, 157 to 161 show dental caries which are correlated with calcium deficiency present in the villages.

This diseases caused by the deficiency of fat[1] in the diet occur in an indirect process. Fats are carriers of essential vitamins. The inadequate supply of fat may result in the inadequacy of calorie consumption by the body. An inadequate supply of calories may change the whole manner of life of a person and be responsible for listlessness, insufficient physical effort, lack of initiative and excessive rest. It may make people more prone to diseases. Fat supplies heat and energy required for performing muscular work. It yields more than twice the energy obtained from proteins or carbohydrates. Fats and oils are one of the costliest items of the diet. Their inadequacies in the current diet are strikingly brought out when the diet is compared with the food supplies needed to attain the medium level of nutrition. Fat is exceptionally valuable as an energy - producing food. For optimal growth, the diet must contain sufficient carbohydrate and fat so that the balanced protein is drawn on only minimally as a source of calories.

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1. The diseases referred to the deficiency of fat have been written by the following writers :
   * Wiggers, C.J.,op.cit.,p.1025.
   * Sukhatme, Pandurang V.,op.cit.,p.3; 98-99.
   * Govil, K.K., Elementary principles of Nutrition and Dietetics, Nutrition Section, Provincial Hygiene Institute, Lucknow (Allahabad, 1959) p.7.
   * Schifferes, J.J.,op.cit.,p.95; 98-99; 105.
   * Proudfit, F.T.,op.cit.,p.369.
   * Pave, A.E., Nutrition and Diet Theraphy (London, 1956),p.24.
   * Diehl, H.S.,op.cit.,p .97.

The energy requirements of human being are provided by the combustion (oxidation) of the end products of carbohydrate, fat, and protein digestion. Fats are often the vehicle of other food substances, such as fat-soluble vitamins, needed by the body. In addition, they form substances (lipids) which insulate nerve tissue. Pancreatic and hepatic disorders restrict fat digestion and absorption so that insufficient energy is available and the fat-soluble vitamins are absorbed poorly. In uncontrolled diabetes, carbohydrate, protein, and fat metabolism is disrupted. ~~Due~~ Owing to deficiency of fat, the heat-store of the body lessens considerably because fats are to conserve the heat of the body and to be stored as fuel. The sicknesses or diseases allied to the fat-deficiency may be of various natures in the villages. All the villages (Tables C XXVIII to CXLII) have deficiency of fat in the diet. In addition to indirect effects of malabsorption of fat-soluble vitamins and poor utilization of carbohydrates and proteins due to fat-deficiency, the diseases of general weakness, flabby muscles and diabetes, correlated with fat-deficiency, are found in numerous villages (Figs. 147, 148, 150, 151,154 to 157, 159 and 161). Biliousness, found in many villages (Figs. 148 to 150, 153, 156, 158, 160 and 161), is associated with deficiency of fat in combination with deficiency of carbohydrate, which have injurious results on health. The remedy is to take sugar at once.

The diseases correlated with the deficiency of protein[1] in the diet are low birth-weight in babies, anaemia, especially in mothers and in young children. There are seven cases of low birth-weight in babies and secondary anaemia found in four villages (Figs. 147, 148, 154 and 161). There is a seeming correlation between the protein level of the maternal dietary and the weight, length, and osseous development of the child at birth. Being the basic material of all body cells, protein is the chief constituent of all muscle, gland and nerve tissue, of many hormones and other body regulators, and of blood. The body needs a daily supply of protein to build new tissue and to replace the tissues that are constantly wearing out. Nitrogen compounds are essential for the building of body tissue, and protein is the source of nitrogen for the body. The protein requirements of the body vary with the rate of growth. Of the specific deficiency diseases, those associated with protein deficiency, and more particularly, with the deficiency of protein of high biological value -- are perhaps the most important.

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1. The details related with the protein-deficiency have been written by the following authors:

   * Corwin, E.H.L.-<u>Ecology of Health</u> (New York, 1949) pp.47 & 53.
   * Proudfit, F.T.,op.cit.,pp.368; 371.
   * Diehl, H.S.,op.cit.,pp.92-93.
   * Sukhatme, P.V,op.cit.,pp.58 & 96.
   * Rene Dubos - " Man Meets His Environment" --U.N.Conference Paper, Science, Technology and Development, <u>Health and Nutrition</u>, Vol.VI, (Washington, 1963)p.6.
   * Kuppuswamy, S.,Srinivasan, M and Subrahmanyan, V. op.cit.,p.4;5.
   * Schifferes, J.J.,op.cit.,p.95;103.
   * Pave, A.E.,op.cit.,p.24.
   * Norman Jolliffe, 'The Pathogenesis of Deficiency Disease' '<u>Clinical Nutrition</u>' by Norman Jolliffe, Tisdal, F.F. and Cannon, P.R. (New York, 1950)p.31.
   * Krehl, cited by Wiggers, C.J.,op.cit.,p.918.
   * Gangulee, N. Health and Nutrition in India (London, Mem, xxxix) p.42.

The biological value of cereal proteins is higher than that of protein from root crops -- starchy roots; while the biological value of animal proteins -- the costliest sources of all -- is greater than that of cereal-proteins. As the quantity of diet diminishes with respect to proteins, and other nutrients also, so do physical stature, efficiency and health. Diminished growth, lessened vigour and impairment of development are the effects of protein deficiency. Stunted growth of body in adults as well as in children has been found in numerous villages (Figs. 147, 149 to 154, 156, 158, 159 and 161) which almost all suffer from protein deficiency in their diet. In addition, general weakness is also present in many of the above villages and in other villages also (Figs. 155 and 157).

The protein deficiency constitutes the largest cause of malnutrition and indirectly of many other forms of disease. Most of the populations of these villages depend upon vegetable proteins; the growth promoting value (Protein Efficiency Rates) of vegetable proteins has been reported, in most cases, to be less than half that of animal proteins; thus the dietary proteins of vegetable origin are not ideally suited to meet the needs of the growing child. This in addition to lack of sufficient calories in their food, leads to widespread protein malnutrition in late infancy and early childhood. The risk of protein deficiency arises from inadequacy of quantity, improper balancing, inefficiency in utilization, and secondary effects of associated components. At low protein intake levels the addition of certain amino acids may lead to amino acid imbalance and impaired growth. Protein is essential to any human diet. No protein, no life. Animal proteins are the complete proteins that contain all the essential amino acids while plant proteins are incomplete. In the human diet it appears advantageous that at least one third of its protein requirements be met by animal proteins.

Edema of the intestinal tract caused by inadequate protein leads to continued poor absorption, and thus a vicious cycle is maintained. The growth and the repair of tissues are largely hindered by the protein-deficiency. Tissue depletion may occur rapidly or slowly depending upon factors :(1) the degree of nutritional inadequacy, (2) the amount of nutrient reserves and (3) the requirement of the body for essential nutrients. Pellagra can be cured by administration of the amino acid also, and all essential amino acids are found in animal proteins. The villages of Junawai and Mugarra Tatei (Figs.154,158) have pellagra cases which may be correlated with protein deficiency as these villages have the large amount of maize in their diet, and protein of maize -- zein -- does not contain amino-acid lysin which is necessary for human growth.

As it is evident from the Nutrition Balance Sheets of the villages, the chief sources of carbohydrate[1] in the diet are cereal grains, sugar, and vegetables and eatable starchy roots. The evidences of dietary deficiency frequently found, where cereals make up a major portion of the diet, are not the result of any deleterious effect of carbohydrates but of the omission of other essential food elements. Thiamine (vitamin B_1) influences carbohydrate metabolism. Changes in carbohydrate intake occur as a factor in reducing blood cholesterol. Carbohydrates, alongwith proteins, fats and vitamins, are chemical classifications of the ingredients in foodstuffs: ~~this clarifies that~~ a deficiency of carbohydrate in the diet mars the human health considerably. The carbohydrate deficiency releases deficient energy to the body by thiamine. Most of the villages have no deficiency of thiamine (Tables C XXVIII - C XLII), yet the carbohydrate-deficiency causes deficient use of thiamine by the body, which is most liable to result in thiamine-deficiency diseases in most of the villages (Figs. 147 to 159 and 161). Exeessive intake of carbohydrates, which may produce some diseases, does not exist in any of the selected villages. But the deficiency of carbohydrates is present in almost all the villages.

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1. The details given about the carbohydrate-deficiency and the resulting ailments have been written by the following authors:
   * Diehl, H.S.,op.cit.,p.97
   * Schifferes, J.J.,op.cit.,p.95;99.
   * Stevenson, G.T. and Miller, C. op.cit.,p.195.
   * Wiggers, C.J.,op.cit.,p.918;998.

As regards niacin (nicotinic acid) in the diet, the Tables C XXVIII to C XLII of the selected villages show no deficiency of it. But, as a matter of fact, nearly all of the villagers, or their majority, use milled flour. The milling of the cereals they eat destroys a strikingly high percentage of this nutrient. Wheat, which is the largest used cereal, alone or mixed with other food-grains, has considerable amounts of niacin but 80-90 percent niacin is removed in milling[1] . The high content of corn meal in the diet for a long period, and/or highly milled white flour produce the disease of pellagra. Further, the milling process of grain removes the pericarp, depriving the food of all vitamin B_1. The vitamin E is found in abundance in all whole-grain cereals. Besides thiamine and riboflavin, the niacin is also one of the best understood constituents of vitamin B-complex. The deficiency of niacin was found to be the cause of pellagra—which has three Ds symbolized for ~~the~~ its characteristic symptoms dermatitis, diarrhea and dementia characteristic of pellagra. Niacine is a part of several enzymes concerned with cell respiration; it is important in the oxidation of carbohydrate; since corn (maize) is low in niacin and tryptophane, pellagra often occurs where corn is the main diet.

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1. Regarding nutritional value, deficiency diseases and other allied descriptions of niacin, the referred matter is written by the following authors :
   * Wiggers, C.J.,op.cit.,p.1006
   * Smillie, Wilson G.,op.cit.,p.405; 403;407
   * Diehl, H.S.,op.cit.,p.100;101
   * Proudfit, F.T.,op.cit.,p.368.
   * Davies, I.G.,op.cit.,p.61.

The restoration and enrichment of cereals have been of great significance in correcting deficiencies of niacin, thiamine and iron, but the processing, marketing and storage of foods may be such that important nutrients are lost. The villages of Junawai and Muggarra Tatei, which have a per head daily consuption of 107 and 64 grams of maize respectively, have each one patient of pellagra-- so much daily consumption of maize is not found in other selected villages.

The nutritive values of the diet of every village and the nutritional deficiency diseases have been dealth with. The relationships of diseases with hygienic, climatic, infectious and endemic characteristics are also to be described.

A perusal of the figures 147 to 161 reveals that besides the deficiency diseases, there are other diseases which are increased by prevailing nutritional deficiencies in the villages; scabies, small-pox, Pneumonia, biliousness, dysentery, rheumatism, tuberculosis and periodical headache. Besides, two endemic diseases, pterygium and epistaxis, are found in the dry tract of sandy <u>bhur</u> ; in the summer hot-and-dry season, the blowing hot dusty wind plays an important role to encourage these diseases ; the former disease develops under the dusty weather conditions while the latter occurs due to hot-dry weather conditions.

~~The~~ S scabies is found in all the selected villages of all types of soils. It is infectious disease and is also associated with vitamin C-deficiency. It is very troublesome skin disease due to a mite, Sarcoptes scabiei, and is acquired by close personal contact with infected persons or from infected clothing, where the mites may remain active for ten days. It may spread when families are huddled together in a small space, with no privacy, with several persons sleeping in the same room, with insufficient facilites for bathing or for keeping the home clean[1].

Rheumatism is associated with the damp climate found in the low-lying areas which are subject to waterlogging and bad drainage conditions. As referred above, the damp climate in combination with deficiency of vitamins B-complex and C may be directly responsible for the occurrence of rheumatism; the villages of Kalyanpur and Guteti Uttar are the best examples of endemicity.

It might be expected that there would be considerable overlapping and blurring in recording between cholera typhoid (enteric) and dysentery, and it must occur often[2]. Dysentery has a correlation with summer hot dry season and the summer mansoon rainy season, when the flies are most active at their pollution work and the drinking water in the rainy season becomes contaminated. It is because dysentery is above all fly-borne, while the enteric group are predominantly water-borne, although flies are also important[3].

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1. Smillie, Wilson G.,op.cit.,p.161
2. Learnmonth, A.T.A.,op.cit.,p.35.
3. Ibid., p. 37.

In view of the poor economic conditions it is very difficult and even impossible for the large number of villagers to regularly afford protective foods -- good sources of animal and vegetable proteins, fats, calcium and vitamins -- to make up the nutritional deficiencies.

The eye disease of night blindness, keratomalacia and xerophthalmia, found mostly in poor people, are collectively having large number of patients in villages of either low rainfall areas or sandy or sandy loam soil tracts: the villages of Salempur, Bichoula, Mullanpur, Junawai, Mugarra Tatei, Guteti Uttar, Shahzadpur and Bhur Khitaura have twenty five such patients.

The climatic vagaries do also influence the human health. The extremes of heat and cold are definitely harmful and even moderately hot conditions increase susceptibility to intestinal diseases, and moderately cold conditions increase susceptibility to respiratory diseases[1]. Besides deficiency of nutrient elements, infection also plays a part in spreading intestinal diseases. Contamination of drinking water, particularly in the season of monsoon rains, is an important factor. The clothes of all the patients as well as of all other healthy persons are washed in the same pool or pond in which the water gathers coming from adjacent lands which are usually used for defaecation throughout the year. Furthermore, it is from the faeces of the persons already suffering from certain intestinal diseases (like cholera,

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1. Winslow, C.E.A. and Herrington, L.P., op.cit., p. 255.

dysentery and typhoid) that healthy people become infected[1] particularly when certain nutritional deficiencies are also present in one's body.

Breathlessness, a respiratory disease, is found mostly in the villages which are situated on the banks of rivers or lie in the low-land areas with bad drainage and waterlogging conditions during the months of summer mansoon rains: they are the villages of Mohammadpur Azampur, Mugarra Tatei, Guteti Uttar and Kalyanpur. There may be some correlation between the occurrence of the disease and possible contamination of drinking water particularly when the underground water-table becomes high during the season of rains; waterlogging and bad drainage conditions may also affect human health adversely. The disease may, in addition, have a cause of vitamin C-deficiency which is largely found in almost all the villages. Most nutritional deficiences and toxaemias also exhibit cause-effect relationship which are usually quite clear while respiratory ailments and other kinds of chronic diseases certainly have such remote and ill-defined etiologies[2].
? against USA spelling)

The tuberculosis is found in the villages lying in the area of low rainfall, Bhur Khitaura, Junawai and Bichoula, which have sandy or sandy loam soil and also suffer from deficient caloric supply of food and under-nutrition. In addition to above endemic relationship,

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1. Leavell, H.- A Report on the Conference Held at New Delhi (Sept.,1956) to discuss the Social and Cultural factors in Environmental Sanitation in Rural India (Govt. of India, Ministry of Health,1957) p.20.
2. Rene Dubos, op.cit.,p.5.

the occurrence of tuberculosis may be correlated with the deficiency of vitamin C. The mortality from tuberculosis is in the village of Bhur Khitaura which has the least rainfull, and poor soil-sandy <u>bhur</u>; the caloric supply of food, being the least in the whole area under review, does also corroborate the fact of both undernutrition alongwith malnutrition. The victim of tuberculosis is also a victim of lowered resistence against disease due to dietary deficiency[1], while many cases of unsuspected open tuberculosis occur in middle aged and elderly persons who belong to the lower income group[2]. The occurrence of the disease (Figs. 148, 154 and 161) is found in adults who also suffer from poverty.

The usual practice of milling the cereal grains, including wheat in particular, is common in nearly all types of villages. Afterwards, the grain-bran is very commonly sieved off, and thus a good source of iron and vitamin B_1 is unknowingly wasted. The recovery from anaemia may be retarded by deficiency of protein or of a number of other essential nutrients while iron, vitamin B_{12}, folic acid, vitamin C and protein are needed for blood formation in man[3].

The cereals constitute the main and most part of the diet is all types of villages. Starchy roots, potato and sweet potato are also included in the average daily diet in some of the villages. But the

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1. Quigley, D.T.,op.cit.,p.55.
2. Miller, R.E. and Henderson, B., cited by Smillie, Wilson G.,op. cit.,p.161.
3. Joint FAO/WHO Expert Committee on Nutrition, Technical Report Series, No.149, Fifth Report, (Geneva, 1958),p.31.

pulses (pigeon pea)- considerably deficient in vitamin C and fat — and sugar ('*gur*'), deficient in all vitamins, fat, protein, phosphorus and iron, are the necessary part of the diet. Minerals —especially calcium and iron -- in starchy roots, cereals and cereal products are of considerable significance to the diet, yet the percentage of these substances contained in cereals or starchy roots is relatively low, which points out that the present foods or combinations of foods are of low physiological value. The production of potato and sweet potato gives at places higher monetary returns to the cultivators than cereals due to larger quantitative production. The starchy foods satisfy hunger but, unless appropriately supplemented, lead to protein-malnutrition, which in turn reduces the efficiency of the man-power available and shortens working life[1].

There is a relationship between deficiency of certain nutrients in the diet and infection of a disease. The intestinal and respiratory diseases, small-pox and scabies, are some of the type. The deficiency of vitamins A and C and the deficiency or poor utilization of thiamine and riboflavin lead to 'lowered resistence to infection, whereas restriction of food, low calorie intake, leads also to lowered resistence[2]. This health problem is intensified in the villages having low calorie intake, for instance, in villages of poor sandy soil.

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1. Joint FAO/WHO Expert Committee on Nutrition, Third Report, Technical Report Series No.72 (Geneva, 1953),p.9.
2. Davies, I.G. - Modern Public Health (London, 1963),p.57.

The climatic variations resulting in precariousness of agriculture affect human health. The undernutrition or malnutrition or both, alongwith ignorance and certain unscientific dietary customs, in addition to bad housing and poor hygienic conditions, have led to the occurrence of various diseases in the villages.

CHAPTER XIII

CONCLUSION

The agricultural land use in the *kharif* as well as the *rabi* season is dominated by grain crops which usually occupy the largest part of the cropped land in almost all the villages. The main source of calories are foodgrains and sugarcane. With the help of cropyields and population the writer prepared Food Balance Sheets for each village which show the caloric intake per head per day in each of them. As grains and sugarcane are the major sources of calories in almost all the villages and meat is not one of the items of their diet because the villagers are vegetarians, the calculation of actual caloric intake indicates the general standard of nutrition in each village.[1]

Since the people of the villages are vegetarians and subsistence farmers, their diet as usual consists of cereals, pulses, *gur*, sugar-juice, jaggery and starchy roots, and they do not take meat, egg and fish, the full measure of daily calorie-intake from farm produce has, therefore, been worked out.

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1. The authenticity of the calculations is increased with the fact that the villages are mostly self-sufficient and there is no import of foodgrains into the villages. Export of the field produce necessary to meet other (non-food) requirements of the villagers is also considerable in most of the villages.

It will be seen from Table C XLIII that the villages lying in the loamy soil tract have mostly lower per head share of the cultivated land and provide greater caloric intake of food per head per day than the villages of other soil types; the calories are between 2,138 and 2,267 in villages of the loamy soil tract while in the villages of medium quality soils —— sandy loam and clayey loam —— the calories are 1,960 to 2,057; the villages of the khadar soil have between 1948 and 1973 calories per head per day. The village of bhur sandy soil provides the least calorie-intake, being 1865, while the per capita cultivated land in village Bhur Khitaura is the largest of all villages. The small per capita share of cultivated land but relatively large caloric intake in the villages of loamy soil tract is due to the high yields of crops per acre, especially of cereal crops; while the large per capita share of cultivated land in the villages having mostly medium or poor quality lands but relatively low caloric intake is due to the low yield of crops per acre. Though villages of Mullanpur and Mohammadpur Azampur have low gross cultivated land per capita yet caloric intake is large due to good productivity of the land.

It may well be concluded that in the villages of well-drained and irrigated loamy soil per capita gross cultivated land, on an average, is 0.902 acre while caloric intake per head per day is 2138 to 2261; therefore the calories per acre of average gross cultivated land amount to 2370 to 2507. The same amount of calories per head per day is provided by 1.336 to 1.412 acres of sandy loam and clayey loam soils, by 2.438 to

Summary Table CXLIII

Showing per capita acreage and daily caloric intake

Sl. No.	Village	Cultivated land acres (per head)	Gross cultivated land (total of both kharif and rabi) (acres per head)	Average gross cultivated land of soil groups (acres)	Caloric intake per head, per day	Comments
I	Salempur	0.835	1.232		2261	
II	Mullanpur	0.544	0.782		2217	
III	Asdharmai	0.633	0.787	0.902	2138	
IV	Mohammadpur Azampur	0.611	0.663		2235	
V	Paindapur	0.457	0.610		2167	
VI	Dhaka	1.157	1.140		2259	
VII	Junawai	0.899	0.884		1960	
VIII	Bichoula	0.998	1.099	1.105	1975	
IX	Shamspur	1.139	1.331		2057	
X	Kalyanpur	0.947	1.006	1.163	1977	
XI	Moazzamnagar	1.266	1.321		2057	
XII	Mugarra Tatei	1.697	2.043		1965	
XIII	Guteti Uttar	2.056	2.078	2.004	1973	
XIV	Shahzadpur	2.113	1.892		1948	
XV	Bhur Khitaura	2.121	1.676	1.676	1865	

2.546 acres of khadar soil, and by 2.129 to 2.253 acres of bhur soil.

It will be seen from Table CXLIII that the net caloric intake in the villages of the area ranges from 1,865 a day (680,725 a year) to 2261 a day (825,265 a year). The average caloric consumption for all the fifteen villages in the districts of Budaun and Shahjahanpur is 2089 a day or 762,485 a year which is in no way equal to that postulated by Professor L.Dudley Stamp, viz. 900,000 calories per year as representing the Standard Nutrition Unit for north-western Europe.[1] This amount, however, closely confirms the calculations by Professor M.Shafi in Eastern Uttar Pradesh which indicate that an actual intake of 2000 calories a day, equivalent to a farm production of a little over 800,000 calories per annum is adequate.[2] The inquiry in the area also reveals that when caloric intake is above 2000 per head per day the standard of living is fairly normal and when it is below 2000, it is perceptibly lower. The agreement of the inquiries in Eastern Uttar Pradesh and the area under review on the amount of actual caloric intake of 2000 a day, equivalent to a farm production of a little over 800,000 per year as adequate, provides a safer ground to take it as a Standard Nutrition Unit for atleast North India to evaluate the standard of nutrition and living of the people.

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1. Stamp, L.D., Our Developing World (London, 1960), p. 110.

2. Shafi, M., Land Utilization in Eastern Uttar Pradesh (Aligarh,1960), p. 222.

It will be clear from the assessment of the caloric consumption in the various villages that the villages of medium or poor quality soils suffer from lower caloric intake of food and the resultant lower standard of living and health as compared to the villages of good quality soil. A valuation of the productivity of each type of land in the selected villages shows that on the basis of present technological advancements a major portion of the village is agriculturally under-developed. The under-development is most marked in the lowlands situated in the middle of the area (villages Kalyanpur and Asdharmai) and in the khadar land of the Gomati river (village Shahzadpur) where the total number of Potential Production Units per acre is very low in comparison to the total land under cultivation, being 0.8, 0.9 and 0.9 P.P.U. per acre in these villages respectively. The reduction in the P.P.U. per acre in such villages is mainly due to low productivity of the cultivated land. The considerably big share of waste land in many villages, particularly in the villages of medium quality lands, also play an important role in reducing the P.P.U. The villages of Junawai, Guteti Uttar, Mugarra Tatei, Mohammadpur Azampur and Kalyanpur possess large acreage of waste land, of which the present productivity is nil. If, however, the waste lands are reclaimed and put to cultivation and, in addition, the productivity of the cultivated land, particularly of medium quality land, is increased it is possible to increase the total number of P.P.U. to a large extent in each village. Most of the banjar waste land can be ploughed and cultivated while the usar waste land can well be reclaimed for cultivation by the methods described on pages 89, 90 and 91.

Reclamation of these lands with the application of farm machinery, soil conservation practices and the application of manures (farmyard manure, human faeces, village refuse, cattle-dung-and urine, bones and green manures) and fertilizers, in addition to the sufficient facilities of irrigation, is liable to change the present picture into a prosperous one.

The practice of fallowing the land in the villages of good quality (A) lands varies from 21 to 52 per cent of the total land under plough in the *kharif* season and 2 to 65 per cent in the *rabi* season (Table CXLIV). In the medium quality (B) land-villages, it is 32 to 72 per cent in the *kharif* season and 41 to 73 in the *rabi* season.

Summary Table CXLIV

Showing the culturable land and the total number of P.P.U. in each village

(areas are given in acres)

Sl. No.	Village	Total cultivated land	Percentage of fallow land in the kharif season to the total cultivated land	Percentage of fallow land in the rabi season to the total cultivated land	Waste land	Total cultivable land	Total number of P.P.U.
I	Salempur	391.713	21	35	-	391.713	435.118
II	Mullanpur	180.475	52	2	2.968	183.443	207.983
III	Asdharmai	388.249	31	45	1.625	389.874	365.569
IV	Mohammadpur Azampur	265.830	39	53	13.160	278.990	263.58
V	Paindapur	86.380	19	48	2.430	88.810	97.69
VI	Dhaka	306.640	37	65	1.520	308.160	331.65
VII	Junawai	744.907	41	60	65.625	810.532	818.213
VIII	Bichoula	326.393	47	44	7.395	333.788	374.635
IX	Shamspur	134.380	32	50	-	134.380	175.06
X	Kalyanpur	298.174	40	54	11.937	310.111	243.466
XI	Moazzamnagar	155.720	41	55	6.110	161.830	158.27
XII	Mugarra Tatei	997.906	39	41	27.970	1025.876	1174.601
XIII	Guteti Uttar	548.850	56	43	57.370	606.220	745.84
XIV	Shahzadpur	281.080	72	48	3.300	284.380	251.10
XV	Bhur Khitaura	695.597	48	73	7.406	703.003	744.427

The practice of fallowing is most common in the less fertile B1 and B11 lands. It is mainly due to want of good manuring and irrigation facilities —— the shortage of even one of them may result in low production; and mostly owing to want of both of them, the cultivators have to put much of their land under fallowing to recuperate fertility. If there is an over-all improvement in the productivity of each type of land, a large number of P.P.Units may still be added in the present number of P.P.Us. It is, therefore, necessary to provide the lands with adequate amount of nitrogenous and organic manures alongwith irrigation in order to increase the yield of crops in them. Manurial experiments, conducted for the application of ammonium sulphate and super phosphate, on the crop yields in the area have shown great potentiality of increased production.

Other organic and nitrogenous manures are very useful, but they are not mostly applied : Cattle-dung and urine, oilcakes, composts and green manures. The dung is totally used in dung-cakes for fuel; oilcakes are given to cattle as fodder; green manuring, the cheepest and best source of building soil fertility, is generally very limited as compared to other crops in the villages, sannhemp and dhaincha may well be used for it, as sannhamp may be grown even on poor sandy soils while dhaincha has the capacity to grow in even adverse climatic conditions. If these plants are grown for green manuring in the fields which are at present left fallow generally, the fertility and productivity of the soils may greatly be increased. The improvement in production will certainly improve economy, nutrition and health.

The above mentioned ways of manuring may be highly beneficial to improve the productive efficiency of the agricultural lands and, as a result, to improve the standard of nutrition, health and economy of the villagers, provided the villagers are trained to this effect and the fodder and fuel material is well supplied to the villages from outside to enable the villagers to prepare manures from cattle-dung, leaves of sugarcane and trees, and oilcakes.

As regards the nutritional deficiencies in diets of the villagers, the villages in which daily caloric intake is below 2000, they suffer more from nutritional deficiency diseases than other villages. Though the villages of greater caloric consumption are not free from malnutrition, yet the villages of lower caloric intake are considerably liable to have both under-nutrition and malnutrition.

The villages where there is no case of mortality due to a deficiency disease are the villages of good quality land having over 2250 calories per head per day (villages Salampur and Dhaka). But the villages of medium quality land have both morbidity and mortality related to certain nutritional deficiencies.

The sufficiency of caloric supply of food is not the guarentee of a nutritionally well-balanced diet. For instance, sugar or <u>gur</u> (unrefined sugar of cane) provides large amount of calories when consumed in big amount as is usually done in the villages, and as a result, its intake increases carbohydrates being about 98 grams per 100 grams. But it does not contain vitamins, fat and proteins.

The morbidity and mortality due to the deficiency diseases or the diseases increased by nutritional deficiencies may be caused even in the presence of large caloric consumption. It is because the deficiency of a nutrient element may produce imbalance in diet and nutrition, and this paves the way for nutritional deficiency diseases in the villages that have been studied.

All the villages, being situated in various types of soils, suffer from deficiencies of certain nutrient elements in the diet. Table CXLV shows these deficiencies:

Summary Table CXLV
Deficiency of nutrient elements in the daily diet.[1]

Villages	Protein (grams)	Fat (grams)	carbo-hydrate (grams)	Vitamin A I.U.	Vitamin B1 mg.	Vitamin B2 mg.	Vitamin C mg.	Calcium mg.	Phosphorus mg.	Iron mg.
Salampur	-	36	-	6378	-	-	198	450	-	-
Mullanpur	-	35	-	6297	-	-	192	447	-	-
Asdharmai	-	37	-	6439	-	-	198	485	-	-
Paindapur	4	40	-	6774	0.13	0.05	182	423	-	3
Mohammadpur Azampur	3	38	-	6207	-	-	192	470	-	3
Dhaka	1	39	-	6772	0.01	-	196	432	-	4
Junawai	2	37	41	5227	-	0.10	189	564	-	-
Bichoula	-	36	-	6032	-	-	200	492	-	-
Shamspur	3	36	14	6218	-	-	197	427	-	-
Kalyanpur	8	40	17	6412	0.17	0.05	195	492	170	7
Moazzamnagar	-	37	21	6588	-	-	193	384	-	1
Mugarra Tatei	14	39	7	6096	-	0.29	152	592	-	6
Guteti Uttar	12	39	8	6149	-	0.28	157	562	-	7
Shahzadpur	7	37	31	6098	-	-	197	412	-	-
Bhur Khitaura	3	37	57	6584	-	0.07	195	539	-	-

1. The deficiencies referred are according to the standard daily requirements of nutrients proposed by W.R.Aykroyd (standard V) for all nutrients, except vitamin B2, for which the standard IV is considered (Chapter XII).

It will be seen from Table CXLV that the deficiency of fat, vitamin A, vitamin C and calcium is found in each type of villages. It is also seen that the deficiency of protein and carbohydrates is found in the average daily diet of many of the villages. There is no deficiency of carbohydrates in any of the villages of loamy soil tracts, while there is some in villages of sandy loam, clayey loam and sandy soil tracts. The poor nutrition, poor standard of living and nutritional deficiency diseases have resulted in poor physique of many of the villagers.

The villages having low caloric supply of food are more prone to both undernutrition and malnutrition than other villages. There is an absence of nutritional treatment of deficiency diseases through intake of good nutritive diets.

The unhygienic living conditions with diet mainly based on cereals leads to morbidity. The morbidity in the villages of loamy soil tract is about 4 to 5 per cent of the total population while in the villages of other soil types it is 5 to about 8 per cent.

Similarly, the mortality in the villages of loamy soil tract is from zero to 0.5 per cent, while in the villages of other soil types, it is from 0.3 to 0.8 per cent.

The morbidity of the nutritional deficiency diseases is at times correlated with the seasonal and climatic conditions and sometimes with endemic peculiarities. For instance, intestinal infection mostly occurs in the hot weather season and rainy season, eye-diseases mostly in hot weather season, while disturbed digestion, re-opening of old wounds, scabies and inflammation mostly occur in the rainy season. The goitre has an endemic correlation with the tarai part of the area being in the northeastern portion.

After all, dietary deficiency state is the root cause of debility and diseases in a large part of the rural population. Vague and indefinite stomach distress, indigestion, colon, constipation general weakness and anaemia —— which are not known by the villagers as the deficiency diseases —— may develop at times into serious diseases or, at least, they reduce the natural resistence against a disease.

None of the selected villages has been found free from nutritional deficiencies. Nevertheless,villages lying in the tract of loamy soil suffer less from nutritional deficiencies than villages of relatively inferior soil tracts. It may be stated that the greater the fertility and productivity of the agricultural lands, the better shall be nutritional standard and health of the people, and vice versa.

There are six villages of loamy soil tract in which only two villages have about 5 per cent morbidity while among nine villages of other inferior quality lands, seven have morbidity of 6 to 8 per cent (Table CXXVI).

In view of the fact that the villages of good quality (loamy) soil get a sufficient caloric supply of food, the diseases therein have resulted from not getting enough "good food" or, so to say, due to malnutrition; while, on the other hand, most of the villages lying in comparatively inferior soil tracts, have inadequate caloric supply of food and are suffering from both under-nutrition and malnutrition. These are more susceptible to mortality and morbidity as a result of malnutrition and undernutrition than the villages of good quality (loamy) soil tract.

The standard requirement of fat in daily diet[1] is 50 grams, whereas its deficiency in various types of villages amounts to 35 to 40 grams. As the fats are the carriers of essential vitamins, their deficiency results in less utilization of vitamins. The fat deficiency causes inadequacy of calories and under-nutrition. It may, therefore, be responsible for diseases of flabby muscles and general weakness with insufficient physical effort, lack of initiative, and excessive rest. The largest share of the daily diet of the people in all selected villages consists of cereals and pulses which contain no amount of ascorbic acid (vitamin C), whereas the standard requirement is 200 mg. This deficiency results in less utilization of iron being responsible for secondary anaemia and retarded formation of body. As the vitamin C has an anti — infective action, its great deficiency, being 152 to 200 mg., may pave the way for tuberculosis (intestinal) and rheumatism infection. Scurvy, bad growth of bones and teeth — the diseases of vitamin C deficiency — are found in all types of villages. Deficiency of calcium is also a major one found in all villages. Rickets, bone deformities, dental caries, bad growth of bones and teeth, osteomalacia,

1. Aykroyd, W.R., op.cit., p. 33.

stunted growth of children and adults are the diseases of calcium deficiency which are found in the villages. Scabies, associated with Vitamin C - deficiency, is found in all villages.

The standard requirement of vitamin A is 7,300 I.U. while its deficiency ranges from 5227 to 6774 I.U. in the diet of the villages. Night blindness, keratomalacia, xerophthalmia, lesions of skin, stunted growth of children and of adults are owing to vitamin A deficiency and are found in almost all types of villages. Bad growth of bones and teeth may also be correlated with vitamin A deficiency. This deficiency produces low resistance to infectious diseases.

The standard requirement of vitamin B1 is 1.8 mg. The deficiency of vitamin B1 is found in villages of Paindapur, Dhaka and Kalyanpur. This deficiency also produces digestive disturbances. Anorexia, general weakness, stunted growth in children in Paindapur and Kalyanpur, constipation in Dhaka and Kalyanpur and rheumatism in Kalyanpur may be correlated with the deficiency of vitamin B1 in the daily diet or its malabsorption by the body.

Riboflavin (vitamin B2), being important for body growth, general well-being, for skin, eyes and mouth, is related to the utilization of protein. Many villages, therefore, have riboflavin deficiency diseases. For instance, angular stomatitis in Kalyanpur, lesions of skin in Junawai and Guteti Uttar, retarded formation of body in villages of Mugarra Tatei and Bhur Khitaura, stunted growth in children in Paindapur, Junawai, Kalyanpur, Mugarra Tatei, Guteti Uttar and Bhur Khitaura may also be additionally correlated with the deficiency of vitamin B2 in the daily diet.

The protein which the villagers get is the vegetable protein. The protein efficiency rates of vegetable proteins have been reported to be less than half that of animal proteins. In addition, three of the six villages of loamy soil tract, two of the three selected villages of sandy loam soil, one of the two villages of clayey loam soil tract and all the four villages of sandy soil (<u>khadar</u> and <u>bhur</u>) have the deficiency of protein even in their vegetarian diets. When their diets remain mostly vegetarian, they do not get animal proteins sufficiently. The growth and the repair of tissues are largely hindered by the protein-deficiency. The protein deficiencies constitute the major cause of malnutrition and the forerunner many other forms of disease. The deficiency of protein weakens the physical stature retarding the body growth. Diminished growth, lessened vigour are also due to protein deficiency. Retarded body formation in the villages of Mohammadpur Azampur, Dhaka, Mugarra Tatei and Bhur Khitaura, anaemia in Bhur Khitaura, pellagra in Junawai, Mugarra Tatei and intestinal disorders in Junawai and low birth weight of babies in Salempur and Bichoula may be correlated with protein deficiency. The utilization of proteins is related with vitamin B2.

It will be seen that the deficiencies of carbohydrates, vitamin B2, phosphorus and protein are mostly found in the diet of villages of medium quality areas (sandy loam, clayey loam and sandy soil tracts) while most of the villages laying in good quality land (loamy soil tract) are free from these deficiencies.

There may be deficiency of several nutrients responsible for one disease: lesions of skin, stunted growth of children and retarded formation of (adult) body may have both vitamin A and B2 deficiencies, bad growth of bones or teeth may have deficiencies of both vitamin C and A and calcium, stunted growth in children may have deficiencies of vitamin A, B1, B2 and protein. The growth of bones may be checked due to deficiency of both calcium and phosphorus.

Similarly, the deficiency of one nutrient may lead to malabsorption of other nutrients, and may produce various diseases. The deficiency of fat and the consequently disrupted metabolism of carbohydrates have injurious results to health and are associated to promote biliousness. In addition to nutritional deficiency diseases, the infectious and other diseases are promoted by deficiencies of nutrients, like the diseases of scabies, small-pox, pneumonia, biliousness, vomiting in children, dysentery, rheumatism, breath~~f~~lessness or asthma and tuberculosis.

Small pox and pneumonia are increased by nutritional deficiencies, while rheumatism is also associated with the damp climate of low lying areas which are often subject to water-logging and bad drainage conditions this factor may combine with the deficiency of vitamins B-complex and C to result in rheumatism; the villages of Kalyanpur (of the central lowland of the area) and Guteti Uttar (of the lowlying Ganga Khadar area) have patients of rheumatism (Figs. 156 and 159). Goitre is found in the _tarai_ parts of the area (Dhaka and Moazzamnagar villages); it is mostly found in the _tarai_ land in the northeast of Pawayan Tahsil, the northeastern part of the area. Breathlessness, a respiratory disease, and tuberculosis, found in low rainfall and sandy (_bhur_) soil areas suffering from both undernutrition and malnutrition, are partly due to vitamin C deficiency. Moreover, the villages having tuberculosis morbidity and mortality cases have deficiency of several nutrients in diet.

Most of the villages having breathlessness are situated on the river-banks (Mohammadpur Azampur, Mugarra Tatei, Guteti Uttar and Kalyanpur) which possess either bad drainage conditions or high water table, especially in the season of rains.

Thus undernutrition, malnutrition, certain unscientific dietary customs alongwith bad housing and bad hygienic conditions coupled with the general ignorance of the people have promoted various deficiency diseases and the improvement of the environmental conditions with adequate and balanced nutrients in their diets will go a long way in improving the health and living standards of the villagers.

GLOSSARY

Local Names		English Names		Botanical Names
Alsi	...	Linseed	...	Linun usitatissimum
Arhar or harera or harra	...	Pigeon pea	...	Cajanus indicus
Auti or aunti	...	boiled juice of sugarcane	...	
Bajra	...	Bulrush millet	...	Pennisetum typhoideum
Bamba	...	Irrigation pipe		
Bankati	...	Deforested area		
Bandh or bund	...	field embankment made either temporarily for irrigation or permanently against a river flood; when the latter, it is a large one.		
Bangar	...	Old alluvium		
Banjar	...	the cultivable waste land		
Barah	...	the cultivated land adjacent to the village settlement, which receives night soil and is generally the good quality land.		
Bejhar	...	A mixed crop of wheat,barley, gram or wheet, barley, peas.		
Bela	...	A sandy soil in khadar land.		
Bhadai	...	crop of broadcast rice which is generally harvested in the Hindi month of Bhadon corresponding to August-September.		
Bhumidhar	...	The owner of a field.		
Bhur	...	The sandy soil being generally poor in texture and weakest of all soils in production of crops.		
Bigha	...	An area measurement; the 1.6 bighas are equal to one acre.		

Local Names		English Names	Botanical Names
Bitaura	...	A huge heap piled up with dung-cakes.	
Charas	...	A means of irrigation drawing water from a well with the help of a large leather bucket, one rope, two bulls with yoke and two men.	
Chari	...	A forage crop; the crop of big millet (jowar).	... Sorghum vulgare
Chirkeen	...	Manure prepared from human faeces.	
Dal	...	The lift method of irrigation from canal.	
Dhaincha	...	A plant of 1.5 to 2 metres height, used as green manure	... Sesbania aculeata
Dhak	...	A big tree, the leaves of which are obtained and kept by the sellers of sweets and chutneys; and the tree is also cut for fuel purposes.	... Butea frondosa
Dhan	...	A variety of rice, sown broad-coast, and the rice is floured for preparing breads.	... Oryza sativa
Dhankar	...	Clayey or clayey loam soil being special for rice crop.	
Dhekli	...	A means of irrigation from a well, pond or stream; it is a wooden liver working on a stake over a half-covered well or on the bank of a pond or stream.	
Dhup or dub or dubra	...	A grass	... Cynodon dactylon
Doab	...	Land between two big rivers.	
Dofasli	...	Land under double-cropping.	
Domat	...	loamy soil.	

Local Names		English Names		Botanical Names
Gahan	...	A beam of wood having wooden nails of about 50 to 64 millimetres length each in its lower surface. It is driven by bullocks to weed out the grass from the ploughed soil.		
Gauhan or gohani	...	The good quality land which receives much manure and is generally double cropped.		
Gochani	...	Wheat-gram (mixed)		
Gojhi	...	Wheat-barley (mixed)		
Goind	...	The well-manured land near the village settlement; it is generally manured with the human defaecation in all seasons continuously. It is mostly double cropped.		
Gul	...	The irrigation drain made by villagers to take irrigation water from a canal or a tube-well.		
Gur	...	lumps of unrefined sugar (of cane).		
Hal	...	plough		
Ikh or Ukh or Ganna	...	Sugarcane	...	Saccharum officinarum
Jarhain	...	Crop of transplanted rice.	...	Oryza sativa
Jhabra	...	The land specially devoted to crop of rice.		
Jou	...	Barley	...	Hordcum vulgare
Jowar	...	Big millet	...	Sorghum vulgare
Kachhi	...	A Hindu sub-caste which raises vegetables and also other crops.		

Local Names		English Names		Botanical Names
Kachhiana	...	The well-manured land specially meant for growing vegetable crops.		
Kadwara	...	a seasonal stream.		
Kallar	...	The waste land (usar) which contains high proportion of clay and is deficient in humus.		
Kamp	...	a sandy soil in khadar areas.		
Kankar	...	Calcarious nodules found in the soil.		
Kans	...	A noxious weed	...	Saccharum spontaneum
Katehr	...	Loamy soil.		
Katil	...	Sandy loam soil.		
Khadar or khadra	...	New alluvium.		
Khapat	...	The khadar soil having clayey subsoil.		
Khalyan	...	The ground meant for gathering the harvested crops for threshing and winnowing.		
Kharif	...	The crop season during the summer monsoon months from mid-June to October.		
Kharra	...	The bad land due to soil erosion		
Khurti or Khulti	...	Madras gram.	...	Dolichas biflorus.
Kiari or Kiraiya	...	small sub-divisions of a field made for irrigation.		
Kodon	...	A small millet	...	Paspahun
Kohra	...	fog	...	scrobiculatum
Kulaba	...	The outlet meant for irrigation from canal. It is under the charge of the Irrigation Department,but when it is not carefully looked after,the irrigation is hampered and much wastage of water occurs.		

Local Names	English Names	Botanical Names
Lahi	... Red mustard	
Lokharia bhur	... The bhur soil area consisting of high sandy ridges.	... Brassica juncea
Loo	... Hot and dry wind in the hot weather season.	
Masur	... Lentil	... Ervum lens
Matiyar	... Clayey loam soil.	
Memri	... Dry shrubs.	
Moong	... Green gram pulse; one of the kharif pulses.	... Phaseolus mungo
Moonj	... The bark obtained from reed (sarwa), and the rough ropes (called ban and tora) are made from it for cot and thatching.	... Saccharum ciliare
Murao	... person cultivating vegetables.	
Nadi	... A small river.	
Nagla	... a hamlet.	
Nai parti	... New fallow land.	
Nala	... A (seasonal) rivulet	
Nai tor	... The land cultivated anew, being formerly as cultivable waste (banjar). If the land is put under fallowing for three continuous years and is then cultivated, it is also known as nai tor. Under the rules of the Revenue Department an agricultural land can not be put under fallowing for more than three years.	
Neel	... Indigo	... Indigofera tinctoria
Neem	... A big tree found almost everywhere in the Indo-Gangetic plain; it has bitter but small leaves.	... Melia indica.

Local Names		English Names	Botanical Names
Ookh or ikh	...	crop of sugarcane	
Palewa	...	The application of the pre-sowing irrigation is locally termed as palewa which provides a depth of moisture in the soil and enables the cultivator to prepare a seed-bed; a rapid seed-bed preparation is obtained by a ~~x~~ lighter palewa.	
Panjsala	...	settlement operation held after five years.	
Patka	...	a sandy soil in khadar lands.	
Pargana	...	The smallest administrative unit of a district, comprising many villages.	
Patela	...	A beam of wood having its down-surface flat and smooth; it is driven by two bullocks to crush the clods of the field while the man remains standing on the beam holding.	
Pipal			... Ficus religiosa
Pokhar,talab or talao	...	pond.	
Poola	...	A bundle of wild grass named sarkara generally used for thatching.	
Raab	...	molasses	
Rabi	...	Season of spring crops, i.e. November to March.	
Rahat or rehat or airath	...	A means of irrigation from a masonry well (Persian wheels). A chain of numerous tin-cans attached to each other to move on an iron wheel which is fixed on an iron shaft, on the other end of the shaft one other wheel moves vertically by a horizontally moving wheel that is forced to move with a wooden shank by two bullocks or a camel. A camel, fairly used in the	

Local Names	English Names	Botanical Names
	western half of Budaun district, is more economical than bullocks, because the bullocks do not generally move around without a driver while the camel, after shutting its eyes with cloth, moves around for many hours without a driver, being driven once. It generally lives on leaves of neem tree and special care of the fodder like for bullocks is not necessary.	
Ras	... unboiled juice of sugarcane.	
Reh	... Efflorescene of sodium salts on the soil. It is used by the village-washermen to wash the clothes.	
Rizka	... Lucerne	... Mudicago sativa
Sann or sanai	... Sannhemp, its raw crop is used as green manuring; when it ripens, the hemp is obtained for making ropes and the debarked stems are used as fuel.	... Crotolaria juncea
Sarson	... Mustard	... Brassica campestris (var. dichotoma)
Sarkara	... A wild long grass, generally used for thatching after drying it.	
Sarwa	... A reed.	
Satthi	... A variety of rice from which bread is prepared.	
Sawan	... A small millet.	
Shakkar or khand	... jaggery.	... Panicum frumentaceum.
Shisham	... A timber tree.	... Dalbergia sisso
Singhara	... Water caltrop	... Trapa bispinosa
Swar	... The usar land which has small amount of salt.	

Local Names	English Names	Botanical Names
Tashil	... The administrative Sub-Division of a district, controlled by a II class magistrate, Sub-Divisional Officer, called Tahsildar.	
Tarah	... Rape	... Eruca sativa
Tarai	... The part of bangar land having high water-table of the under-ground water, and does not need irrigation mostly.	
Thandi bhur	... The bhur soil with some moisture retaining capacity, being better than other bhur soils - the lokharia bhur or the urani bhur.	
Til	... An oilseed	... Sesamum indicum
Urani bhur	... The bhur soil consisting of the sand brought by the blowing winds.	
Urd or urad	... Black gram, one of the kharif pulses.	... Phaseolus radiatus
Usar or usra	... The waste land being unculti-vable owing to presence of salinity or alkalinity.	
Zaid	... The extra season of crops (of melons, water-melons, cucumber and vegetables) grown after the rabi season and it corresponds with the hot-weather season.The zaid crops are generally grown in the dry beds of big rivers like Ganga, Ramganga, Garra, Khannaut and Gomati, while vegetables in other lands are occasionally grown when sufficient irrigation is available. The zaid means extra.	

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M A P S

Survey of India maps	1 inch to a mile :	53 L/7,8,12,15,16.
	1 inch to a mile :	53 P/3,4,8,11,12,15,16.
	1 inch to a mile :	54 M/1,5,6,7,9,10,11,13,1
	1 inch to a mile :	54 I/13.
	1 inch to a mile :	62 D/3,4,7,8.
	1 inch to a mile :	63 A/1,2.
	1 inch to 4 miles:	53 L, 53P.
	1 inch to 4 miles:	54 M, 54I.
	1 inch to 4 miles:	62 D.
	1 inch to 4 miles:	63 A.

APPENDIX I

QUESTIONNAIRE

Dated................

Name of the Village.............. Tahsil..........District............

1, House No.

2. Number of persons in the family:

   A. No.of adults:

      (i) Male..............

      (ii) Female............

   B. No.of children.................

3. Diet generally taken by the villagers in:

   (a) Winter Season..

   (b) Dry Summer Months......................................

   (c) Summer Monsoon Season..................................

4. General Sanitation and Drainage............................

   ....

   ....

   ....

5. Condition of the House: (a) masonry, (b) mud-house, (d) thatched house.

6. House is with/without ventilators.

7. Conditions of sleeping rooms:

   (a) separate sleeping rooms................................

   (b) One-room hutment......................................

8. Condition of well used for drinking water:

I. (a) masonry..

(b) non-masonry..

II. Condition of cleaning the well:

monthly/half-yearly/annually/many years after

9. (a) Condition of ponds dilapidated or well maintained...............

....

(b) Practice of washing the clothes of patients in the pond.........

....

10. The practice of keeping cattle within residential compounds..........

....

11. No.of patient/patients

I. Adults:

(a) Males...

....

(symptoms of the disease or the name of the disease)

(b) Females...

....

(name or symptoms of the disease).

II. Children:

(name or the symptoms of the disease)............................

....

12. No.of patient/(s) who lost their lives:

I. Adults:

(a) Males...................... (b) Females......................

II. Children......................

13. Treatment, if anyk

Males...

Females...

Children..

14. Number of persons suffering from various ailments:

Diseases	Adults		Children
	Male	Female	
Night-blindness			
Scurvy			
Dental caries			
Goitre			
Flabby muscles			
Lesions of skin			
Anorexia (loss of appetite)			
Dyspepsia			
Anaemia			
General weakness			
Slow healing of wounds			

Re-opening of old wounds
Constipation
Rickets
Scabies
Small-pox

APPENDIX II

NUTRITIONAL DEFICIENCY DISEASES

1962 - 1963

MORTALITY CASES ARE ENCIRCLED

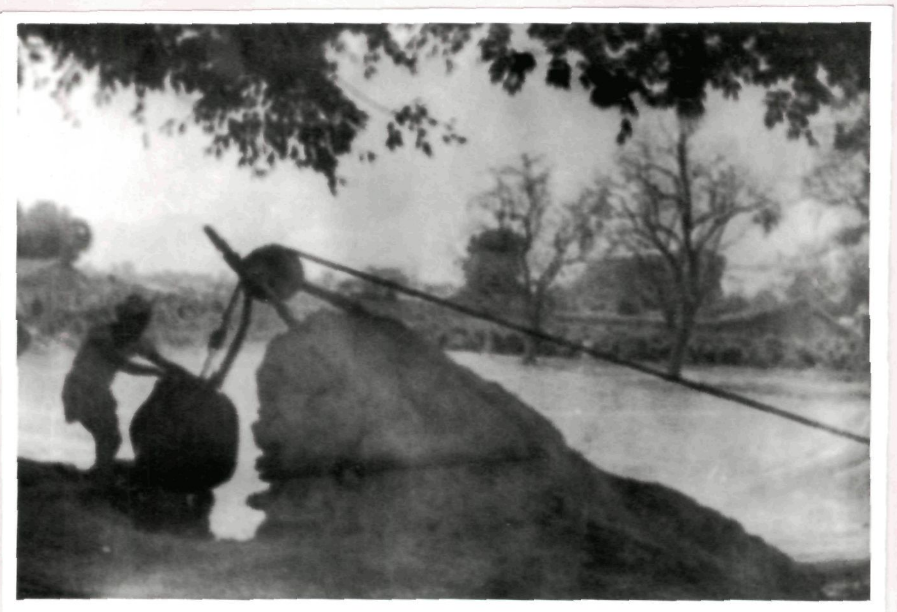
	Salempur			Bichoula			Mullanpur			Asdharmai			Paindapur			Mohammadpur Azampur			Dhaka			Junawai			Shamspur			Kalyanpur			Moazzam-nagar			Mugarra Tatei			Guteti Uttar			Shahzadpur			Bhur Khitaura		
	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C
Night blindness	1	1	-	1	-	-	1	1	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	1	-	1	-	-	1	1	-	-	-	-	-	-	-	-	1	-
Keratomalacia	1	1	-	-	1	-	-	1	-	-	-	1	-	-	-	-	-	1	-	-	1	-	-	1	-	-	-	-	-	-	-	1	-	-	-	1	-	-	1	-	-	1	-	-	1
Xerophthalmia	-	1	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Scurvy	-	-	-	1	-	-	1	-	-	1	1	-	1	-	-	-	1	-	-	1	-	1	1	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	1	-	-	-	-	-
Dental caries	1	1	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	1	-	1	1	-	-	1	-	1	-	-	1	1	-
Bad growth of bones or teeth	-	-	-	1	-	-	-	-	-	2	1	-	1	-	-	-	1	-	-	1	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-
Breathlessness	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1(1)	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	1	-	-	-	-	-	1	-	-
Angular stomatitis (inflammation of mouth & tongue)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Goitre	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Flabby muscles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Follicular keratosis or lesions of skin	1	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-
Anorexia (loss of appetite)	-	1	-	-	-	-	-	1	-	-	-	-	-	1	-	1	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-
Dyspepsia	1	-	-	-	1	-	1	-	-	-	1	-	-	-	-	-	1	-	1	-	-	3	1	-	-	-	-	1	-	-	1	-	-	1	1	-	1	1	-	1	-	-	1	-	-
Famine dropsy	-	-	-	(1)	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diabetes	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nervous irritability	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Secondary anaemia	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Pellagra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Osteomalacia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Retarded formation of body (adults)	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	1	1	-
General weakness	1	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	2	1	-	1	-	-	1	-	-	1	-	-	-	-	-	-	1	1	-	-	-	1	2	-
Slow healing of wounds	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	1	-	-	-	-	-	-	-	1	1	-
Constipation	-	-	-	1	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	2	1	1	-	-	-	-	-	-	-	-	-
Low birth weight in babies	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stunted growth in children	-	-	1	-	-	-	-	-	1	-	-	1	-	-	1	-	-	-	-	-	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	2	-	-	1	-	-	-	-	-	2
Rickets	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-

DISEASES INCREASED BY NUTRITIONAL DEFICIENCIES

1962 - 1963

	Salempur			Bichoula			Mullanpur			Asdharmai			Paindapur			Mohammadpur Azampur			Dhaka			Junawai			Shamspur			Kalyanpur			Moazzam-nagar			Mugarra Tatei			Guteti Uttar			Shahzadpur			Bhur Khitaura		
	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C	M	F	C
Periodical headache	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-
Disease in bronchial tubes	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scabies	1	1	1	1	-	1	1	-	-	1	-	1	-	1	-	1	1	1	-	1	-	5	4	1	1	-	-	1	1	-	-	1	-	1	3	2	1	1	-	1	-	-	1	2	-
Dysentery	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	2	2	-	-	-	-	-	-	-	-	-	1	2	1	-	-	-	-	-	-	-	-	-
Biliousness	-	0	-	-	1	-	-	1	-	1	1	2	-	-	-	-	0	-	1	-	-	-	-	-	0	-	-	1	-	-	0	-	-	1	1	0	-	-	-	1	-	-	1	-	-
Rheumatism	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1(1)	-	-	-	-	-	-	-	-
Pneumonia	-	-	-	-	-	-	1	-	-	1	-	1(1)	-	(1)	-	1	-	-	-	1	-	2(1)	1(1)	-	-	-	-	(1)	1	-	-	-	1	-	-	-	-	-	1(1)	-	-	(1)	(1)	-	-
Tuberculosis	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(1)	-
Re-opening of old wound & fractures	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-
Child vomiting	-	-	1	-	-	-	-	-	1	-	-	1	-	-	1	-	-	-	-	-	-	-	-	3	-	-	1	-	-	-	-	-	-	-	-	2	-	-	1	-	-	1	-	-	-
Small-pox	-	-	-	-	-	-	-	-	1(1)	-	-	1(1)	-	-	-	-	-	(1)	-	-	-	-	-	3(2)	-	-	1(1)	-	-	1(1)	-	-	(1)	-	-	1(2)	-	-	2	-	-	-	-	-	-

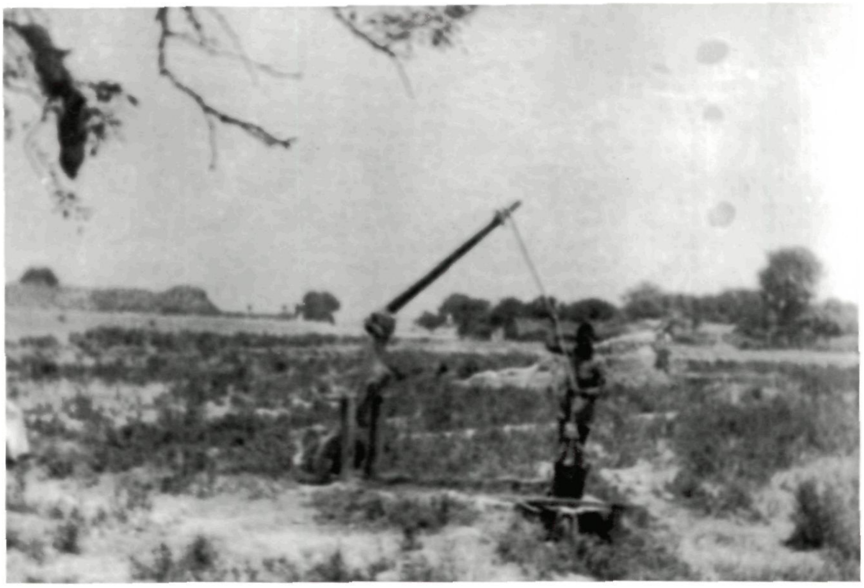
Irrigation by charas



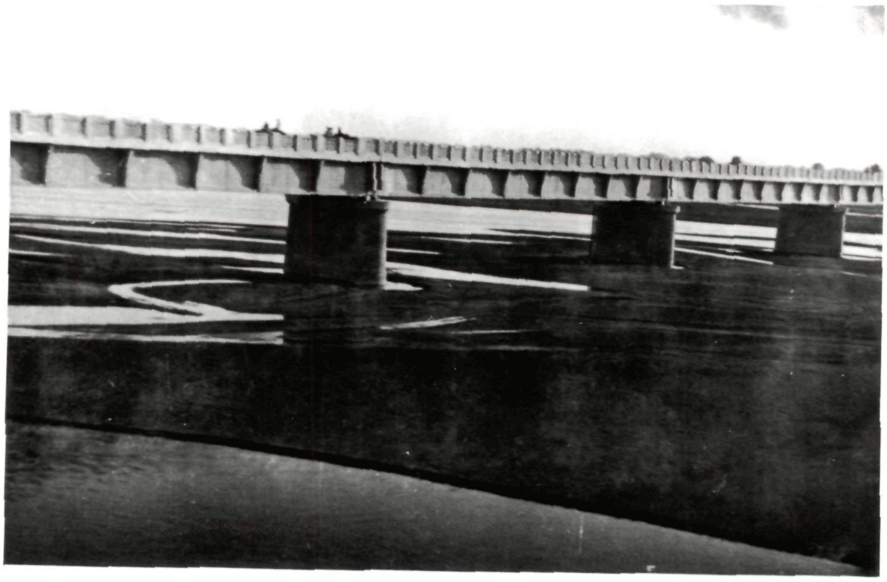
Another view of irrigation by charas

Irrigation by Rahat (Persian Wheel)

Dhekli —— a local means of irrigation with two cans on the ends of a rope.



Another type of dhekli : a local means of irrigation



Ramganga bridge

Land is being ploughed to prepare for sugarcane sowing, it is locally known as '<u>pandra</u>'.

Sowing of sugarcane

Another view of sugarcane sowing

The soil in between plants of sugarcane is spaded.

The clods of soil in between sugarcane plants are being trodden with a wooden trodder, after spading.

The kassi, a hoe, is used for soil preparation in sugarcane production. A hubble-bubble of the farmers is also seen in the field.

Sugarcane crop.

Sugarcane crop:the plough is passed in between plants to soften the soil, spade is also used occasionally, a spade is seen in the left foreground.

Sugarcane - ready for harvest

Harvest of sugarcane

Loading of sugarcane

Manure - pits

Loading of compost manure to carry to fields.

Unloading of manure in a field.

Dung-cakes are prepared, dried and piled up into numerous heaps in villages; a mass of chari fodder is also seen.

Numerous heaps of dung-cakes on the outskirts of a village.

Dry leaves of trees in villages are gathered and heaped for household fuel purposes.

Dry bed of the river Garra is cultivated with cucumbers, melons, water-melons, however the limited stream of the river is also seen.

A view of dry bed of Garra river

Another view of dry bed of Garra river

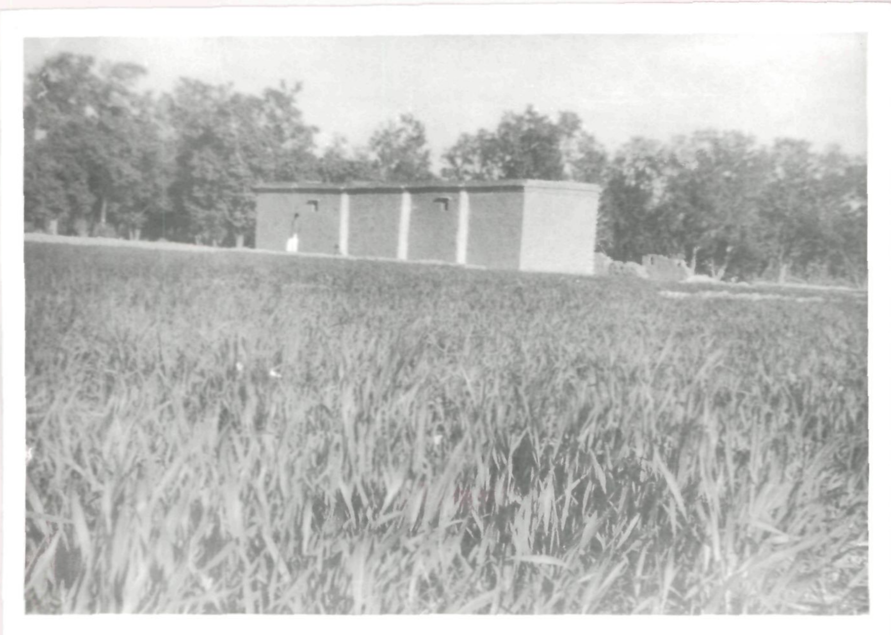
Another view of dry bed of Garra river

A wooden bridge is made seasonally by the cultivators on the river Garra.

Gutiyas - a masonry wheel, divided in parts, is prepared by potters to build a well which is less expensive than a masonry well of bricks and is more durable than a non-masonry well.

Another view of gutiyas.

Crop of arhar (pigeon pea).



A view of growing crop of chari.

A view of the area once occupied by the river Sot in the west of Budaun city. A huge remnant landmass —— the upper surface coincides with the old city ground level, while the lower level coincides with the former bed of the river which has now shifted its bed to about one kilometre away.

A view of cultivable waste (banjar) land; a cultivated field is also seen in the foreground.

A view of khaliyan where harvests of cereal crops are heaped and threshing is done through feet of cattle moving for hours around a stake.

Another view of khaliyan —— threshing and winnowing.

A view of manured and unmanured crops of wheat which were both irrigated; the manured crop is in the right.

Harvest of potato

A view of Shahjahanpur branch canal

Poor housing in villages —— huts without any ventilators or windows, cattle are usually kept within residential compounds.

Another view of poor houses

The back of the poor thatched houses are also without ventilators or windows.

Another view of village houses.

Poor houses in village Asdharmai